Series 1960, No. 9

Issued December 1963

SOIL SURVEY

Dewey County, Oklahoma

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
OKLAHOMA AGRICULTURAL EXPERIMENT STATION

HOW TO USE THE SOIL SURVEY REPORT

THIS SURVEY of Dewey County, Oklahoma, will serve several groups of readers. It will help farmers in planning the kind of management that will protect their soils and provide good yields; assist engineers in selecting sites for roads, buildings, ponds, and other structures; and add to our fund of knowledge about soils.

Soil scientists studied and described the soils and made a map that shows the kind of soil everywhere in the county. Their map, at the back of this report, was made from a set of aerial photographs on which woods, roads, and many other landmarks can be seen.

Locating the soils

Use the index to map sheets to locate areas on the soil map. The index is a small map of the county that shows the location of each sheet of the soil map. When the correct sheet of the soil map is found, it will be seen that the boundaries of the soils are outlined and that there is a symbol for each soil. Suppose, for example, an area on the map has the symbol CeB. The legend for the detailed map shows that this symbol indentifies Carey silt loam, 1 to 3 percent slopes. This soil and all others mapped in the county are described in the section "Decriptions of Soils."

Finding information

This report has special sections for different groups of readers. The section "General Facts About the County" discusses early history, climate, markets, and other subjects of interest mainly to those not familiar with the county. The section "General Soil Map" is useful both to those who are not acquainted with the county and to those who need to plan management of large tracts of soils.

Farmers and those who work with farmers can learn about the soils in the section "Descriptions of Soils," and then turn to the section "Use and Management of Soils." In this way they first identify the soils on their farms and then learn how these soils can be managed and what yields can be expected. The soils are grouped by capability units; that is, groups of soils that need similar management and respond in about the same way. For example, Carey silt loam, 1 to 3 percent slopes, is in capability unit IIe-1. The management needed for this soil will be found under the heading "Capability Unit IIe-1" in the section "Use and Management of Soils." The "Guide to Mapping Units," just ahead of the map sheets, gives the name of each soil, the page where it is described, the symbol of the capability unit in which it has been placed, and the page where each capability unit is described.

Farmers who want information about management of native range can turn to the section "Range Management," where the soils used mainly for grazing have been placed in range sites. The description of each range site shows the principal native plants on the site and the estimated yields of forage in favorable and unfavorable years. The name of the range site in which each soil has been placed and the page on which it is described are shown in the "Guide to Mapping Units."

Farmers who want to protect their fields, livestock, and homesites from wind will want to read the section "Woodland and Windbreaks." Those interested in improving habitats for wildlife will find information in the section "Wildlife."

Engineers and builders will find information that will assist them in the section "Engineering Properties of the Soils."

Soil scientists and others interested in the nature of soils can learn how the soils were formed and how they are classified in the section "Genesis, Morphology, and Classification of Soils."

* * * * *

This soil survey was made as part of the technical assistance furnished by the Soil Conservation Service to the Dewey County Soil Conservation District. Help in farm planning can be obtained from the staff of the Soil Conservation Service assisting the district. Fieldwork for this survey was completed in 1960. Unless otherwise indicated, all statements in the report refer to conditions in the county at the time fieldwork was in progress.

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SOIL SURVEY OF DEWEY COUNTY, OKLAHOMA

BY CARTER A. STEERS, JIMMIE W. FRIE, AND EDWARD S. GROVER, SOIL CONSERVATION SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH OKLAHOMA AGRICULTURAL EXPERIMENT STATION

DEWEY COUNTY is in the west-central part of Oklahoma (fig. 1). It is bounded on the west by Roger Mills and Ellis Counties, on the north by Woodward and Major Counties, on the east by Blaine County, and on the south by Custer County. It is rectangular in shape and is about 42 miles in length from east to west and 24 miles in width from north to south. The land area is about 977 square miles, or 625,280 acres. Taloga, the county seat, is centrally located.

General Facts About the County

Agriculture is the principal source of income in the county. Much of the acreage is used for range. Wheat and cotton are the main cash crops. Other small grain, alfalfa, and sorghum are grown mostly as feed for livestock. In many places, erosion has depleted the soils, and about 60,000 acres of abandoned cropland has been either reseeded or allowed to revert naturally to native grasses.

History and Early Culture

Dewey County was organized in April 1892, at the time of the land run for the Cheyenne Arapaho Reservation. On that April morning, settlers raced across the Cherokee Strip to the land that now makes up part of five western counties. "D" County, as Dewey County was known before Oklahoma became a State, was centrally located in the old Cheyenne Arapaho Territory. For years, this area had been populated only by the land-owning Indians and by cattlemen who leased a sizable acreage from the Indians for range. Cattle bought in Texas were fattened here while en route to the railheads in Kansas for shipment to eastern markets. Between 1874 and 1893, 11 million cattle were driven over the Dodge City Trail, which passed just west of Vici.

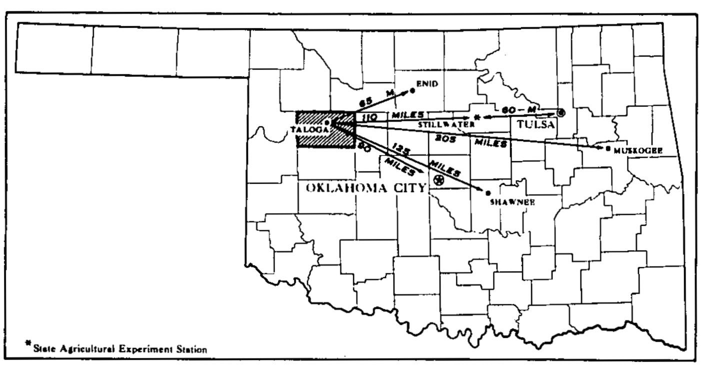

Figure 1.—**Location of Dewey County in Oklahoma.**

Settlement in Dewey County was typical of that of most western frontiers. Claims were restricted to 160 acres. Timber in the eastern part and along drainageways provided the settlers with heat and housing material, but the cutting was restricted by government regulation. Wild game, berries, and fish made up a large part of the food supply.

The county was named for Adm. George Dewey, hero of the battle of Manila Bay. The county seat was named Taloga, an Indian word meaning beautiful valley. Taloga is south of the South Canadian River. Early settlers in and near Taloga had to cross the river to obtain supplies from the two large trading centers. Woodward, to the north, was the nearest railroad depot. Kingfisher, to the east, was the supply center for cut lumber, hardware, and fresh food. The trails to both were hazardous.

To the early settlers, the South Canadian River was a wide ribbon of churning, red water that separated into three channels. More dreaded than the water was the quicksand on the river's flood plain. Thousands of animals, tame and wild, fell prey to this boggy sand. Fords were scarce and were continually being changed by the earlier settlers. In 1909, a bridge was constructed across the river near Taloga. It had to be replaced in 1915 and again in 1957. The only other bridge across the South Canadian River in the county was constructed in 1954 and is south of Camargo.

Early housing consisted largely of white tents and dugouts along stream banks. Later, the white tents were replaced by split-log houses with white tent tops. The dugouts became the half dugouts with log sides and fronts. Still later, log houses of cedar became the typical home. A few prefabricated houses were imported; one of these was the first permanent county courthouse. Only a few smooth-sided frame houses were built by the early settlers.

During the first year of settlement, Taloga consisted of a trading post, three grocery stores, a newspaper office,

and a saloon. The saloon was used as a community center, a cafe, and a church. The construction of railroads helped the growth of Leedey, Camargo, Vici, and Fay. The first county election was held in 1893, and the first public school was opened at Taloga the same year.

Drainage, Relief, and Vegetation

Dewey County is a red-bed plain dissected by two rivers and many streams. It is mantled in places by old alluvial deposits of sand and silt. The South Canadian River and its tributaries drain the northwestern, central, and southeastern parts. The North Canadian River and its tributaries drain the north-central and northeastern parts. Tributaries of the Washita River drain the extreme south-central and southwestern parts.

In the area drained by the South Canadian River and its tributaries, the topography ranges from level uplands, flood plains, and terraces to rough, broken canyons and dunes. The flood plains and terraces along the South Canadian River are paralleled by irregular, rough, red sandstone canyons and bluffs, on which there are wavy deposits of sand and gravel. The adjacent higher areas consist of small isolated flats and rolling hills, drained by narrow gypsum-ledged creeks. Broad areas mantled with sandy deposits occur in the eastern part of the county, in the vicinity of Oakwood; in the west-central part, in the vicinity of Webb; and in the extreme northwestern part. The vegetation on the flood plains, on the lower terraces, and on most of the uplands consists mainly of tall native grasses. On the higher and more clayey uplands, the vegetation is made up mostly of mid grasses and some tall grasses. In the more sandy areas, there is a good growth of tall native grasses, but oak is dominant in the broader sandy areas. Sand sagebrush grows along the borders of these areas and in isolated areas of sand and gravel. Trees of many species grow along the streams.

In the northeastern and north-central parts of the county, drained by the North Canadian River, the topography is similar to that near the South Canadian River, except that the rough broken land bordering the flood plains and terraces is less distinct. These rough sandstone breaks also parallel broad areas that have a sandy mantle. The native vegetation is largely mid and tall grasses. Oak is dominant in the more sandy areas. Sand sagebrush occurs at the edges of the sandy mantle and on the fingering sandy inclusions in the vicinity of Oakwood.

In the southern part of the county, which is drained principally by tributaries of the Washita River, there is less variation in the topography and vegetation than in other parts. The silty and clayey soils, underlain by red sandstone, are nearly level to rolling. They are drained principally by small creeks that feed the larger tributaries. Wide, fertile bottom lands border the tributaries. On the uplands, the native vegetation consists mostly of mid and tall grasses. On the bottom lands, it consists mostly of tall grasses. Trees of various species occur along the borders of the drainage channels.

Native short, mid, and tall grasses are common in the county. The species generally considered to be short grasses are buffalograss, blue grama, and hairy grama. Side-oats grama is the dominant native mid grass, but vine-mesquite, sand dropseed, tall dropseed, western wheatgrass, and Canada wildrye are also common. Both short and mid grasses are suited to the fine-textured and shallow soils of the county. Tall native grasses include Indiangrass, switchgrass, big bluestem, little bluestem, sand bluestem, and silver bluestem. They are common to all parts of the county but are better suited to the sandy and loamy soils. Inland saltgrass, nutgrass, and alkali sacaton are suited to wet areas.

Woody plants grow mainly on sandy deposits or drainageways. Among the more common species are sand sagebrush, blackjack oak, shinnery oak, and buckbrush. Other brush plants include yucca, saltcedar, tamarix, dogwood, wild currant, sumac, and skunkbush. Common deciduous trees include American elm, Chinese elm, ash, cottonwood, honey locust, black locust, bur oak, red oak, hickory, Russian mulberry, common mulberry, hackberry, walnut, chittamwood, pecan, sycamore, catalpa, and bois d'arc. Redcedar is the most common evergreen, but there are a few species of pine in the county.

Industries

The operation of grain elevators is the principal small industry in the county. Some elevators furnish facilities for storage, for grinding or rolling feed, and for cleaning and treating seed. Only one cotton gin is in operation at this time. Two nurseries are located at Oakwood.

The production of oil and gas is a growing industry. The first gasline across Dewey County, a 24-inch line, was completed in 1960. Many test wells have been drilled. Most producing wells are more than 9,000 feet in depth. New production methods and higher oil and gas prices have made such deep fields profitable.

There are several sand and gravel pits operating in the county, and some sand and some gravel are removed from the abandoned channels of the South Canadian River. Most of this material is shipped to towns and cities for construction purposes. Other sand and gravel pits, scattered throughout the county, furnish material for road construction.

The bentonite quarries, in the northwestern part of the county, produce some of the most nearly pure bentonite clay ever found. The beds are about 3 to 5 feet thick. This material is trucked to Camargo and loaded on rail cars for shipment to commercial centers.

Water

Wells supply most of the water for household use in the county and much of the water for livestock. Most wells produce good quality water at a depth of less than 80 feet. In the red-bed areas, however, the water is commonly hard because of the content of gypsum. Many of the wells in these areas are more than 130 feet deep. Ponds and small springs also provide water for livestock. The flow of some of the larger creeks depends on these small springs.

Only a few test holes have been drilled in the county to check underground water supplies for use in irrigation, but it is generally assumed that the red-bed areas do not have sufficient water for this purpose. The river terraces are more likely to have enough water to support irrigation. The Canton Reservoir and some of the flood-detention structures on the upper Washita River are also potential sources of water for irrigation.

Transportation, Markets, and Towns

Dewey County is served by three railroads. The Missouri-Kansas-Texas Railroad crosses the western part from north to south and serves Leedey, Trail, Camargo, and Vici; the Atchison, Topeka and Santa Fe Railway crosses the southeastern corner of the county and serves Nobscot and Oakwood; and the Saint Louis-San Francisco Railway crosses the extreme southeastern corner and serves Fay.

State Highways 3, 34, 47, and 51 and U.S. Highways 60, 183, 270, and 281 provide the county with routes to the large towns and cities. Several truck lines and motor-express lines serve the principal towns and make daily connections with Oklahoma City, Enid, Woodward, and Clinton.

Most of the county's products are marketed locally. Local commercial haulers transport some agricultural products to market by truck, but many farmers haul their own products. Most of the wheat, other small grain, and sorghum are hauled to elevators at Vici, Camargo, Trail, Leedey, Fay, Oakwood, and Taloga. Some grain is hauled to nearby towns outside the county. The only cotton gin in operation is at Leedey. Much of the cotton is transported outside of the county for marketing. Livestock is bought and sold at the auction at Seiling. Fruit, vegetables, and posts are also sold here. Some livestock is shipped to markets at Woodward, Clinton, and Oklahoma City.

Seiling, Leedey, Vici, and Taloga, the largest towns, have populations of between 450 and 1,000. Camargo, Fay, Oakwood, and Putnam are smaller. Rural community centers include Webb, Lenora, Rhea, Burmah, Aledo, Cestos, Humac, Nobscot, and Trail.

Climate [1]

Dewey County has a temperate, continental climate. Cold, dry air from the Arctic Circle and warm, moist air from the Gulf of Mexico alternately influence the weather.

Seasonal changes are gradual. Winter is open and is moderate to cold. At times, winter winds from the north, accompanied by snow, cause a sudden drop in temperature. Locally, these storms are called "northers." They usually last 3 or 4 days. During this time, livestock must be provided with additional feed and care. Spring is a season of variable weather, relatively high precipitation, and, frequently, severe local storms and tornadoes. Summer is hot, but the high temperatures are offset to some extent by cool nights, low humidity, and cooling breezes. Fall has long periods of pleasant weather interspersed with moderate to heavy rains.

Table 1, compiled from records of the U.S. Weather Bureau at Oakwood, gives important climatic data for the county. The average annual temperature for Dewey County is 59° F., but summer temperatures have reached 118°, and winter temperatures have fallen to −20°. During the last 30 years, readings of zero or below occurred on 29 days in 13 different years. In this period, on the average, there were 12 days each year when the temperature did not rise above freezing. The warm season is long.

[1] This section was prepared with the assistance of STANLEY G. HOLBROOK, state climatologist, U.S. Weather Bureau.

TABLE 1.—*Temperature and precipitation at Oakwood, Dewey County, Okla.*

[Based on a 30-year record, through 1960]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average monthly total	One year in 10 will have—		Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover of 1 inch or more
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—		
	° F.	*° F.*	*° F.*	*° F.*	*Inches*	*Inches*	*Inches*	*Number*	*Inches*
January	48	23	66	4	0.85	0.1	1.8	3	2
February	53	28	73	12	1.11	.2	2.2	1	3
March	63	33	80	17	1.37	.1	3.3	1	2
April	72	46	87	31	2.04	.6	5.3	(1)	6
May	77	55	93	42	4.93	1.8	10.1	0	0
June	90	65	100	55	3.27	.9	6.1	0	
July	95	69	103	61	1.91	(2)	3.9	0	0
August	95	68	105	59	2.47	.3	5.1	0	0
September	84	60	97	46	2.73	.3	6.0	0	0
October	76	49	90	35	2.28	(2)	5.8	0	0
November	61	35	76	20	1.03	0	2.8	(1)	2
December	51	28	68	15	1.06	(2)	2.7	1	2
Year	72	47	(3) 106	(4) −1	25.05	17.6	35.0	6	3

[1] Less than 0.5 of a day.
[2] Trace.
[3] Average annual highest maximum.
[4] Average annual lowest minimum.

Temperatures of 100° have occurred as early as May and as late as September, and temperatures of 90° have occurred as early as March and as late as October. In December 1955, an unseasonable temperature of 91° was recorded. Temperatures of 100° or higher have occurred on the average of 21 days each year. In 1952, there were 52 days when the temperature was 100° or higher. Figure 2 shows the monthly mean temperatures over a period of 50 years.

The average annual rainfall, based on a 30-year record at Oakwood, is about 25 inches. The range in annual rainfall is from 11.6 inches in the driest year to 43.3 inches in the wettest year. About 33 percent of the annual precipitation falls in spring, 31 percent in summer, 24 percent in fall, and 12 percent in winter. May is the wettest month, and September is second. This periodic rainfall is favorable for the production of wheat and other small grain because it occurs when moisture is needed for initial fall growth and for maximum spring growth. Moisture conditions are also favorable for cotton and sorghum because rainfall occurs throughout the growing season. Tall native grasses grow extremely well in most years. In normal years, moisture conditions are favorable for alfalfa and sudan.

Rains late in spring, in summer, and early in fall often come as hard showers. Occasionally more than 2 inches of rain falls in an hour. Winter rains are fairly gentle. Wet spells are infrequent, but occasionally they delay harvesting, and they may delay planting or necessitate the replanting of some crops. Seed that has been planted is often lost because of the crusting of soils after a hard rain. Each year hard rains cause the loss of crops, seed, and soil.

Snowfalls of 8 inches are not uncommon (fig. 3). The snow often drifts into roads and around farmsteads and makes travel by auto impossible for a few days. Snowstorms have occurred as late as April and as early as October. Snow seldom covers the ground for longer than 2 weeks, and generally remains only for 3 or 4 days. From 7 to 12 inches can be expected annually; half of this generally comes in one storm. The heaviest snow in one season was 28 inches in 1959–60, and the heaviest snow in one day was 9 inches in February 1940.

Dry spells, extending from July into August, often damage native pasture and are frequently the cause of decreased cattle prices. These spells, which range in length from 4 to 8 weeks, are fairly common and are often accompanied by hot winds. Although they seriously damage crops, they seldom cause crop failures. Cotton, sorghum, alfalfa, and sudan are damaged most frequently, but wheat is more likely to be a total loss.

Crop failure does not generally result from 1 year of below average rainfall. For instance, in 1952, when the total rainfall in Dewey County was only 12.66 inches, wheat yields were among the best. However, below average rainfall for 4 consecutive years or more will cause widespread crop failure. Such periods have occurred three times in the last 60 years (fig. 4). Extended drought, accompanied by strong winds, resulted in the dust storms that have done extensive damage in the Great Plains States. Figure 5 shows the monthly rainfall data for the county from 1900 through 1959.

In spring, summer, and fall, the wind is generally from the south. In winter, it is commonly from the north. Wind velocities average about 14 miles per hour. During the violent squalls and severe thunderstorms that are fre-

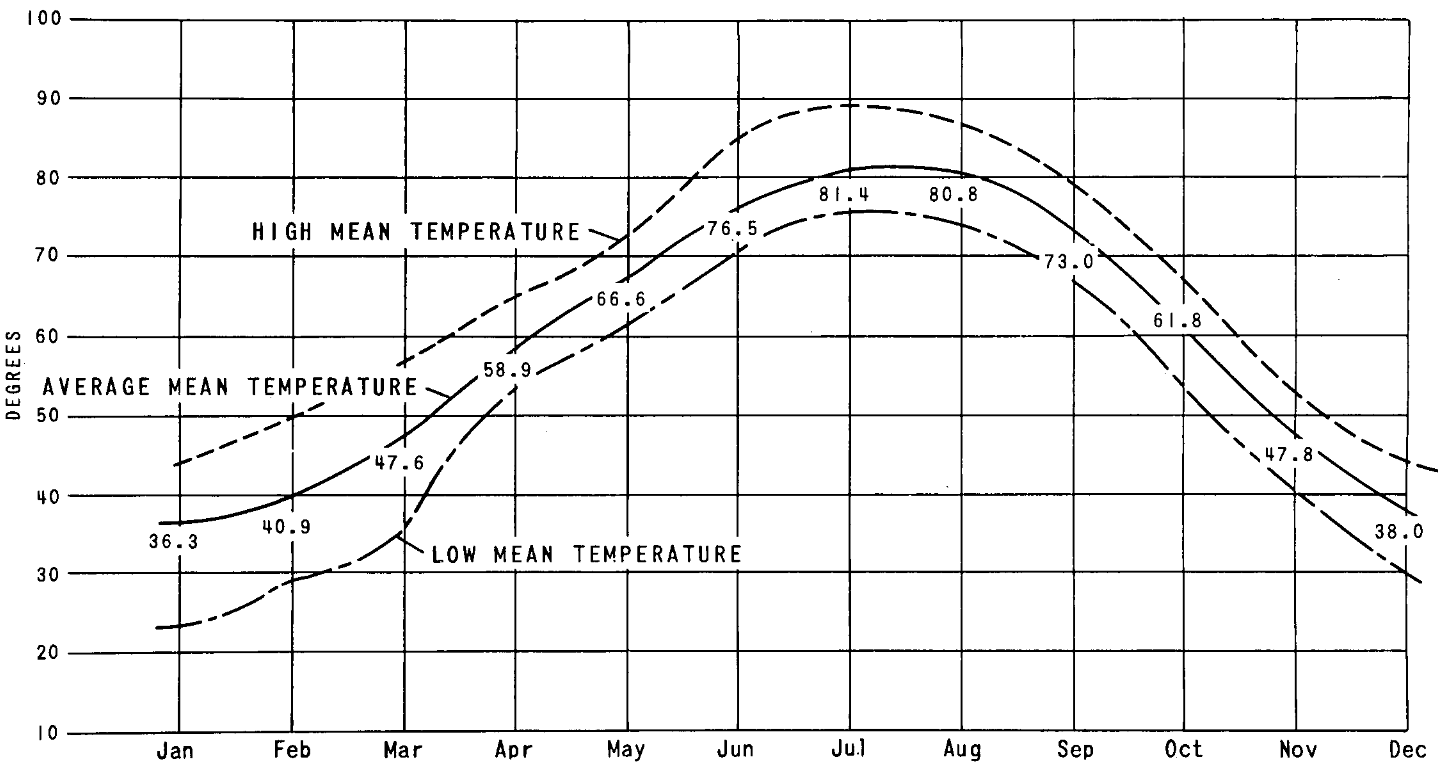

***Figure 2.*—Monthly mean temperatures from 1909 to 1959, from data collected by U.S. Weather Bureau Station at Oakwood, Okla.**

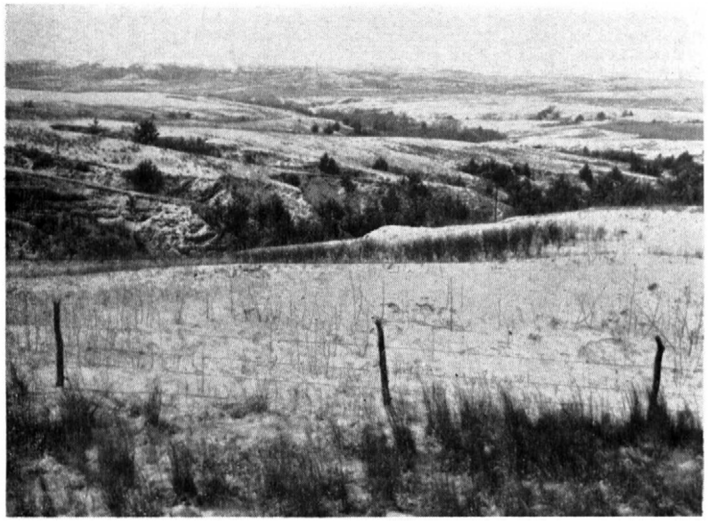

Figure 3.—Typical snow scene on range.

quent in spring, winds of 25 to 40 miles per hour and gusts of up to 80 miles per hour occur. These storms do little damage unless they are accompanied by hail or intense rain. They are seldom severe enough to produce violent duststorms, but storms of long duration are capable of moving great quantities of soil. Tornadoes are the most dreaded storms in the county. Records indicate that 23 tornadoes have occurred in Dewey County since 1915. The Leedey tornado in 1947 was the most severe.

Hailstorms and rains of high intensity are more destructive to crops and property than tornadoes. Hailstorms occur in strips about ½ mile to 2 miles in width and several miles in length and usually extend in a southwesterly to northeasterly direction. They are second only to drought as a single cause of crop failure and are responsible for more than 10 percent of the county's crop failures.

Large amounts of water are lost through evaporation. Moisture received during July and August is often rapidly evaporated by high temperatures and hot, dry winds. At times, summer-growing plants are harmed to such an extent by these winds that they are unable to recover. Crops growing on clayey soils are most likely to be damaged by wind parching and summer drought.

Table 2 gives the probable dates of the latest frost in spring and the earliest frost in fall. The average frost-free growing season is 193 days. The latest frost recorded was on May 15, 1942; the earliest, on September 17, 1947. Late frosts often kill or damage fruit buds but seldom reduce yields of small grain. Early frosts often reduce cotton yields.

Agriculture

This subsection gives some statistics on agriculture in the county, as reported in the U.S. Census of Agriculture.

During the first 67 years of agriculture in the county, soil erosion was extensive. The most serious erosion occurred in areas where row crops were grown continuously. Much of this eroded land has now been taken out of cultivation (fig. 6).

Land use has changed considerably in the last 35 years. In 1924, sorghum, corn, and cotton were the principal row crops. Sorghum was then grown on 37,346 acres; corn on 31,050 acres; and cotton on 6,139 acres. Only wheat accounted for more acreage; it was grown on 82,957 acres. Oats, the only other extensively grown small grain, ac-

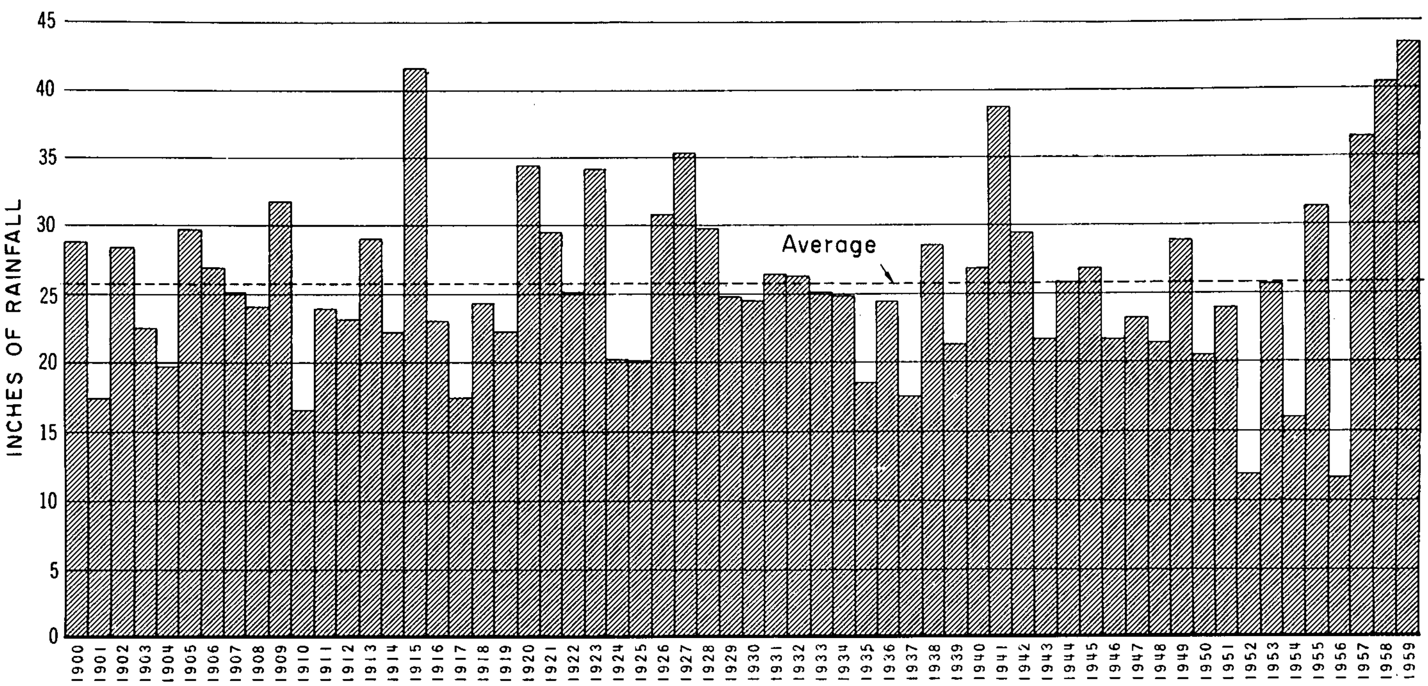

Figure 4.—Annual rainfall for Dewey County, Okla., from 1900 through 1959. Data for 1900 to 1909 based on records of U.S. Weather Bureau Station at Taloga, Okla. Date for 1909 through 1959 based on estimates and records of U.S. Weather Bureau Station at Oakwood, Okla. Records at Oakwood were not complete for a 12-year period, and data for that period had to be adjusted.

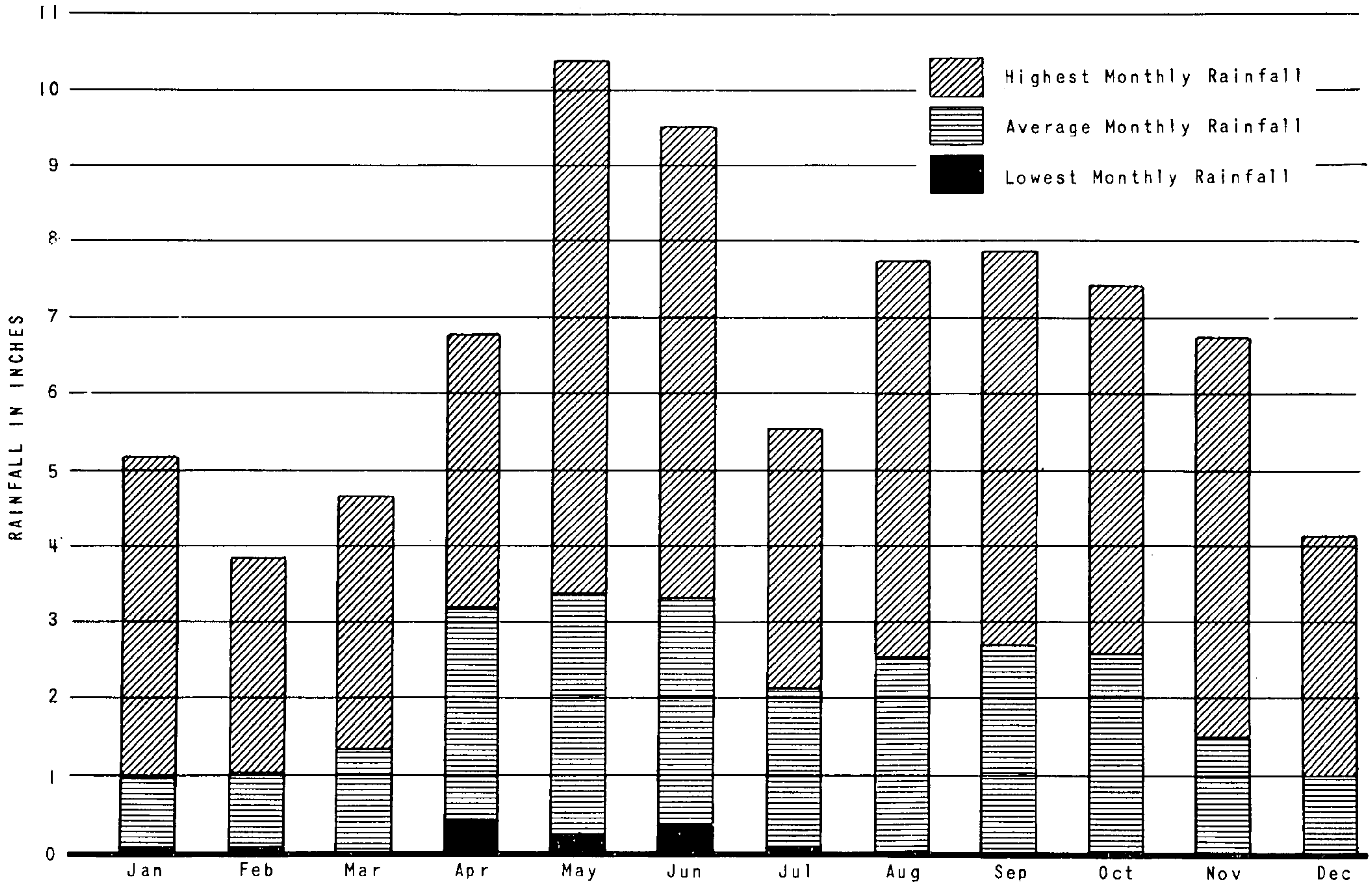

***Figure 5.*—Monthly rainfall data for Dewey County, Okla., from 1900 to 1959. Data for 1900 to 1909 based on records of the U.S. Weather Bureau Station at Taloga, Okla. Data for 1909 to 1959 based on records of the U.S. Weather Bureau Station at Oakwood, Okla.**

counted for 6,367 acres. By 1959, the acreage in wheat had increased to 97,446 acres. The acreage in corn had decreased to 571 acres, and the acreage in cotton to 4,137 acres. The considerable decrease in the acreage in corn resulted from reduction in the number of hogs and full realization of the fact that the climate is not suitable for corn. In 1959, sorghum was grown on 24,938 acres; oats on 4,957 acres; rye on 2,514 acres; barley on 12,764 acres; and hay crops, including alfalfa and small grain cut for hay, on 5,762 acres. Most of the alfalfa and sorghum grown are used as feed for livestock.

***Figure 6.*—Severely eroded soil now unsuited to cultivation.**

The number of farms in Dewey County decreased from 1,408 in 1950 to 936 in 1959, but in the same period the average size of the farms increased from 424.9 acres to 629.5 acres.

Table 3 shows a comparison of the number of farms in the various size groups for stated years.

Crops

There are a number of crops that can be grown in Dewey County under dryland farming. Wheat, sorghum, and cotton are well adapted to the climate. Alfalfa, oats, barley, rye, sudan, and broomcorn are also well adapted but are not profitable enough to be grown to any great extent. Corn, clover, and cowpeas are grown but are often damaged by drought.

The management practices for row sorghum, for cotton, and for corn are about the same. The soil is listed late in winter, then cultivated in spring to kill the weeds. Seedbeds generally are cultivated twice before the crop is planted. After the crop is up, it is cultivated and sometimes hoed. If heavy rains occur soon after the crop is

TABLE 2.—*Probabilities of last freezing temperatures in spring and first in fall at Oakwood, Okla.*

Probability	Dates for given probability at temperature levels shown				
	16° F.	20° F.	24° F.	28° F.	32° F.
Spring:					
1 year in 10, later than	Mar. 20	Apr. 2	Apr. 7	Apr. 15	May 2.
2 years in 10, later than	Mar. 14	Mar. 27	Apr. 2	Apr. 11	Apr. 26.
5 years in 10, later than	Mar. 4	Mar. 17	Mar. 24	Apr. 2	Apr. 14.
Fall:					
1 year in 10, earlier than	Nov. 14	Nov. 4	Oct. 30	Oct. 19	Oct. 10.
2 years in 10, earlier than	Nov. 21	Nov. 11	Nov. 4	Oct. 25	Oct. 15.
5 years in 10, earlier than	Dec. 5	Nov. 23	Nov. 13	Nov. 4	Oct. 24.

planted, a surface crust may form and prevent the seedlings from emerging. This crust must be broken, or the crop must be reseeded. Cotton is most likely to be affected by surface crusting. A surface crust on fields of small grain generally can be broken by a rotary hoe, but at times reseeding is necessary.

The time of tillage for small grain is governed by summer rains. Summer tillage helps to kill weeds and volunteer growth. One-way plows, moldboard plows, sweeps, and listers are most commonly used. Field cultivators, disks, section harrows, and spring-toothed harrows are generally used to level and firm the soil for seedbeds. Drills are being improved so that they will be capable of sowing seed in rough, trashy seedbeds. Tillage that leaves stubble on the surface helps to control wind erosion.

Wheat.—More than half of the county's cropland is planted to hard, red winter wheat. The early maturing varieties are grown more extensively each year. Wheat is sown between September 15 and November 15. In some seasons, planting may be as early as September 1 or as late as December. October 1 is the ideal planting time for the best yields of both winter pasture and grain.

Harvest usually is begun about June 10 or June 15 and generally is completed by the first week in July. Most of the crop is handled by combines, but some may be swathed for threshing at a later date. Much of the crop is taken directly to the elevator. Some is stored on farms. Soils that are to be replanted to wheat normally are worked immediately after harvest. After summer rains, the soils are again tilled to kill volunteer growth and weeds and to establish a firm seedbed for fall planting. Wheat is usually not sown until about September 15. If sown earlier, it is likely to be damaged by insects.

TABLE 3.—*Comparison of number of farms in the various size groups for stated years*

Size in acres	1940	1950	1954	1959
	No. of farms	*No. of farms*	*No. of farms*	*No. of farms*
Less than 10	81	57	43	5
10 to 99	257	119	67	43
100 to 179	543	263	195	137
180 to 259	247	166	107	77
260 to 499	528	468	417	265
500 to 999	210	237	266	271
1,000 or more	65	98	98	138
	Acres	*Acres*	*Acres*	*Acres*
Average size	309. 9	424. 9	489. 4	629. 5

Wheat can be grown continuously on good soils if the residues are left on the surface. When moisture conditions are favorable, fertilizers can be applied at planting time.

Sorghum.—Sorghum is grown both as wet and dry forage for livestock and as a grain substitute for corn. It is planted late in May or early in June, after the soil has warmed up. Forage sorghum is resistant to heat and dry weather, and on most soils yields are dependable. Grain sorghum is affected by unfavorable weather, and yields are erratic. Some varieties can be cut for fodder if they fail as a grain crop.

The time of harvest depends on the variety grown and on the method of harvest. Beginning about the first of September, forage sorghum is harvested by ensilage cutters, binders, and balers. Most grain sorghum is harvested by combines after the first frost. A little is headed by hand. Most grain is stored on the farm and used locally. Some is sold at the local elevators. Soils to be replanted to sorghum are usually worked late in winter and reworked early in spring to be ready for spring sowing.

Growing sorghum continuously is not a good management practice. It leaves the soil bare when erosion is most likely to occur. Generally, only small amounts of plant residues are returned to the soil. Fertilizer applied at planting time or as a side dressing is desirable if the soil is to be used primarily for sorghum. Grain sorghum depletes the soil less than forage sorghum.

Cotton.—The cotton acreage in the county has fluctuated. The peak was in 1934, when there were 26,257 acres in cotton. The low was in 1959, when there were only 4,137 acres. Because of the handwork required, large yields are needed to show a profit. Cotton production in the county has been considerably aided by fertilizers, improved varieties, and mechanical harvesters. Fertilization of cotton is a common practice on the sandy soils.

Cotton needs a clean, firmly packed seedbed. Ordinarily, the finer textured soils are plowed in fall and then worked in spring before planting time, which is from May 5 to May 25. The sandier soils can be both plowed and worked in spring. Cultivation begins as soon as a good stand is established. Plants are thinned when they reach a height of 5 to 6 inches. Farmers often spray both to control insects and to defoliate the plants if the cotton is to be harvested by mechanical means. Hand harvesting begins as soon as a sizable number of bolls open and continues as later bolls open. Hand harvesting normally be-

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gins late in September and continues until early in winter. Mechanical harvesting usually takes from the middle of October to the first of November.

Other small grain.—These crops include barley, rye, winter oats, and spring oats. They are generally grown for feed and for winter pasture. Strong-stemmed, early maturing, winter-hardy varieties are best suited to the soils in this county. Except for spring oats, the planting dates are about the same as for wheat. Spring oats are sown in February or early in March. Often, rye and barley are sown much earlier than wheat so as to provide early fall pasture.

Harvesttime for oats and other small grain is about the same as for wheat. Some of the more common methods of harvesting are baling, binding, and combining. If the crops are cut for hay, they are usually harvested when the seed is in the early dough stage, which normally is 2 to 3 weeks before the combining period. Oats, rye, and barley are seldom grown on the same soil for 2 years in succession. If they are, the management is about the same as that for wheat. These crops can be plowed under as green manure, or they can be used for pasture. Barley is the only small grain widely sold on price-supported markets. Most other crops are used locally as feed for livestock. These crops are seldom grown continuously, and they are fertilized only occasionally.

Alfalfa.—Alfalfa grows well on the bottom lands, and if properly managed it also produces good yields on the nearly level uplands. Normally, about four or five cuttings of hay are obtained from crops on bottom lands (fig. 7). Two to four cuttings usually can be expected on the uplands. The average life of an alfalfa stand is about 5 years. Stands may be damaged or occasionally killed by droughts.

Obtaining a good stand is the chief problem in the production of alfalfa. The soil must be worked and reworked to obtain a level, firm seedbed. Seed commonly is planted by drills early in fall or in spring. Small grain, generally oats, is often seeded with alfalfa to provide an early protective cover that will prevent soil blowing. After heavy rains, surface crusting may necessitate reseeding. The spotted alfalfa aphid occasionally damages alfalfa stands, and it has killed young seedlings.

***Figure 7.*—First cutting of alfalfa on Canadian loam, early in June.**

Alfalfa is harvested throughout spring, summer, and fall. Commonly, it is mowed and baled. The first cutting is in mid-June or late in June. In some years, the last cutting is early in October. Alfalfa is sometimes windrowed and threshed for seed about the time of the first frost. Occasionally, it is used for pasture late in summer and in fall.

In this county, it is difficult to include alfalfa in any specific rotation. Occasionally, a top dressing of phosphate fertilizer is applied to old stands.

Other crops.—Soybeans, cowpeas, clover, and vetch are some of the minor crops of the county. These legumes are grown both for spring and summer pasture and as soil-building crops. The acreage varies. In years of adequate moisture, clover grows wild in eroded areas and on abandoned fields. These areas furnish good spring pasture for livestock.

Corn, sudan, and millet are planted in spring and are used for livestock feed. Millet and sudan are grown for hay or for summer pasture. Normally, these crops are harvested late in September. Corn is used for ensilage or matured for a grain crop.

Berries and fruit are grown as minor cash crops. Raspberries, blackberries, and boysenberries are grown in small areas and sold locally. Fruits, such as pears, peaches, apricots, cherries, and plums, are also grown and sold in local markets. Several farms have orchards and melon patches for private use.

Broomcorn is a very minor crop. It is grown and managed in much the same way as sorghum. After the broomstraw is pulled, the plants furnish a small amount of pasture.

Livestock

Cattle ranching is still one of the most important enterprises in the county. More than half of the agricultural acreage is used for range. Beef production is second only to wheat production as a source of income. The cattle population totaled 43,518 in 1959; only 2,622 were milk cows. Table 4 shows livestock trends from 1940 through 1959.

TABLE 4.—*Livestock of all ages on farms of Dewey County, Okla.*

Livestock	1940	1950	1959
Cattle and calves	[1] 33,014	37,346	43,518
Hogs and pigs	[2] 6,733	5,631	4,955
Sheep and lambs	[3] 3,718	1,004	2,006
Horses and mules	[1] 6,067	2,227	980
Chickens	[2] 114,756	[2] 97,601	[2] 39,937

[1] Over 3 months old. [3] Over 6 months old.
[2] Over 4 months old.

Cattle.—Herds of both grade and purebred beef cattle are maintained in the county. The dominant breeds are Hereford, Shorthorn, and Angus. Most small-herd farmers breed mixed grade cows to purebred bulls. Desirable heifer calves are kept to improve the herd. Steers are commonly marketed when they weigh 500 to 800 pounds. Culled heifers and brood cows are marketed annually.

Most farmers have good registered bulls. Many farmers buy a few registered brood cows to help build up a select herd. There are a few large herds made up entirely of registered animals in the county.

Supplementary feed generally is necessary in winter. Often such feed is only used in very cold weather or in snowstorms. Wheat pasture is used for wintering and fattening a considerable number of cattle, and often additional steers and heifers are purchased for the purpose of pasturing winter wheat. Silage, alfalfa, oats, and sorghum hay are used as a filler and as supplementary winter feed. Cottonseed and soybean cake or meal is also used as a supplementary high-protein feed.

Dairy cattle are of minor importance in the county. Many farmers and ranchers keep a few milk cows of mixed breed. Surplus cream is taken to local markets or picked up by commercial firms. Dairy animals are of mixed or purebred Shorthorn, Holstein, Jersey, and Guernsey breeds.

Hogs.—Hogs are kept on most farms where grain sorghum or corn is grown. Few farmers have large herds, because most of the grain is needed for cattle feed. There are only a few purebred herds, but all animals are of good quality. Most hogs are of the Hampshire, Berkshire, or Poland China breeds.

Sheep.—Of the few sheep raised, the principal breed is the Hampshire, a dual-purpose breed kept to produce both mutton and fleece. A few Angora goats are used to help control brush in wooded pastures.

Poultry.—Most ranchers and farmers raise chickens for private use. Flocks are maintained by purchasing chicks from commercial hatcheries. Most flocks are of well-known breeds. Surplus eggs are generally sold at local markets. A few flocks are raised for contract markets. There are also a few turkey flocks in the county.

How This Survey Was Made

Soil scientists made this survey to learn the kinds of soils in Dewey County, where they are located, and how they can be used.

They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug or bored many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down to the rock material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to uniform procedures. To use this report efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, the major horizons of all the soils of one series are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Carey and St. Paul, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in natural characteristics.

Many series contain soils that differ in the texture of their surface layer. According to such differences, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. St. Paul silt loam and St. Paul clay loam are two soil types in the St. Paul series. The difference in the texture of their surface layers is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into soil phases. The name of a soil phase indicates a feature that affects management. For example, St. Paul silt loam, 0 to 1 percent slopes, is one of several phases of St. Paul silt loam, a soil type that ranges from nearly level to sloping.

After a fairly detailed guide for classifying and naming the soils had been worked out, the soil scientists drew soil boundaries on aerial photographs. These photographs show buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this report was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientist has a problem of delineating areas where different kinds of soils are so intricately mixed, and so small in size, that it is not practical to show them separately on the map. Therefore, he shows this mixture of soils as one mapping unit and calls it a soil complex. Ordinarily, a soil complex is named for the major soil series in it, for example, Woodward-Carey complex. Also, in most mapping, there are areas to be shown that are so rocky, so shallow, or so frequently worked by wind and water that they cannot be called soils. These areas are shown on a soil map like other mapping units, but they are given descriptive names, such as Broken land or Eroded sandy land, and are called land types rather than soils.

Only part of the soil survey was done when the soil scientist had named and described the soil series and mapping units and had shown the location of the mapping units on the soil map. He still had to present the mass of detailed information he had recorded in different ways for different groups of users, among them farmers, managers of woodland and rangeland, and engineers.

To do this efficiently, he had to consult with persons in other fields of work and jointly prepare with them groupings that would be of practical value to the different users. Such groupings are the capability classes, subclasses, and units, designed primarily for those interested in producing the short-lived crops and tame pasture; range sites, for

those using large tracts of native grass; woodland suitability groups, for those who manage wooded tracts; and the classifications used by engineers who build highways or structures to conserve soil and water.

General Soil Map [2]

After study of the soils in a locality and the way they are arranged, it is possible to make a general map that shows several main patterns of soils, called soil associations. The seven soil associations in Dewey County are shown on the colored general soil map in the back of this report. Each association, as a rule, contains a few major soils and several minor soils, in a pattern that is characteristic although not strictly uniform.

The soils within any one association are likely to differ from each other in some or in many properties; for example, slope, depth, stoniness, or natural drainage. Thus, the general soil map shows, not the kind of soil at any particular place, but patterns of soils, in each of which there are several different kinds of soils.

Each soil association is named for the major soil series in it, but, as already noted, soils of other series may also be present. The major soils of one soil association may also be present in another association, but in a different pattern.

The general map showing patterns of soils is useful to people who want a general idea of the soils, who want to compare different parts of a county, or who want to know the possible location of good-sized areas suitable for a certain kind of farming or other land use.

[2] By JIMMIE W. FRIE, soil scientist, Soil Conservation Service.

1. St. Paul-Carey-Holdrege association: Loamy uplands

This association is composed of nearly level to strongly sloping soils on dissected uplands. It covers about 24 percent of the county and is mostly in the vicinity of Seiling, Putnam, and Leedey.

St. Paul, Carey, and Holdrege soils are dominant. St. Paul soils occur on the nearly level to sloping uplands. They are dark brown, clayey, and well drained, and they have a compact subsoil. Level areas may be covered with water for short periods after heavy rains. Carey soils occur on the gently sloping to strongly sloping uplands. They are reddish brown, loamy, and well drained. Both St. Paul and Carey soils are deep over weathered sandstone or shale of the red beds. Holdrege soils are on gently sloping to sloping uplands and are dark brown and loamy. They are underlain by water-deposited material or in some places by wind-deposited material.

Quinlan, Woodward, Yahola, Canadian, Port, Lofton, and Vernon soils are the minor soils in this association. A complex of Quinlan and Woodward soils, in which Quinlan soils are dominant, occurs on strong to steep slopes of drains. Quinlan soils also occur on steep side slopes of deep, V-shaped drains. Yahola and Canadian soils are along local drains that flow to the larger rivers. Port soils occur only in the vicinity of Leedey, along local drains that flow to the Washita River. Lofton soils occupy poorly drained depressions on the nearly level uplands. Vernon soils are in sloping to very steeply sloping areas west and north of Leedey.

Figure 8 shows a typical pattern of the soils in this association.

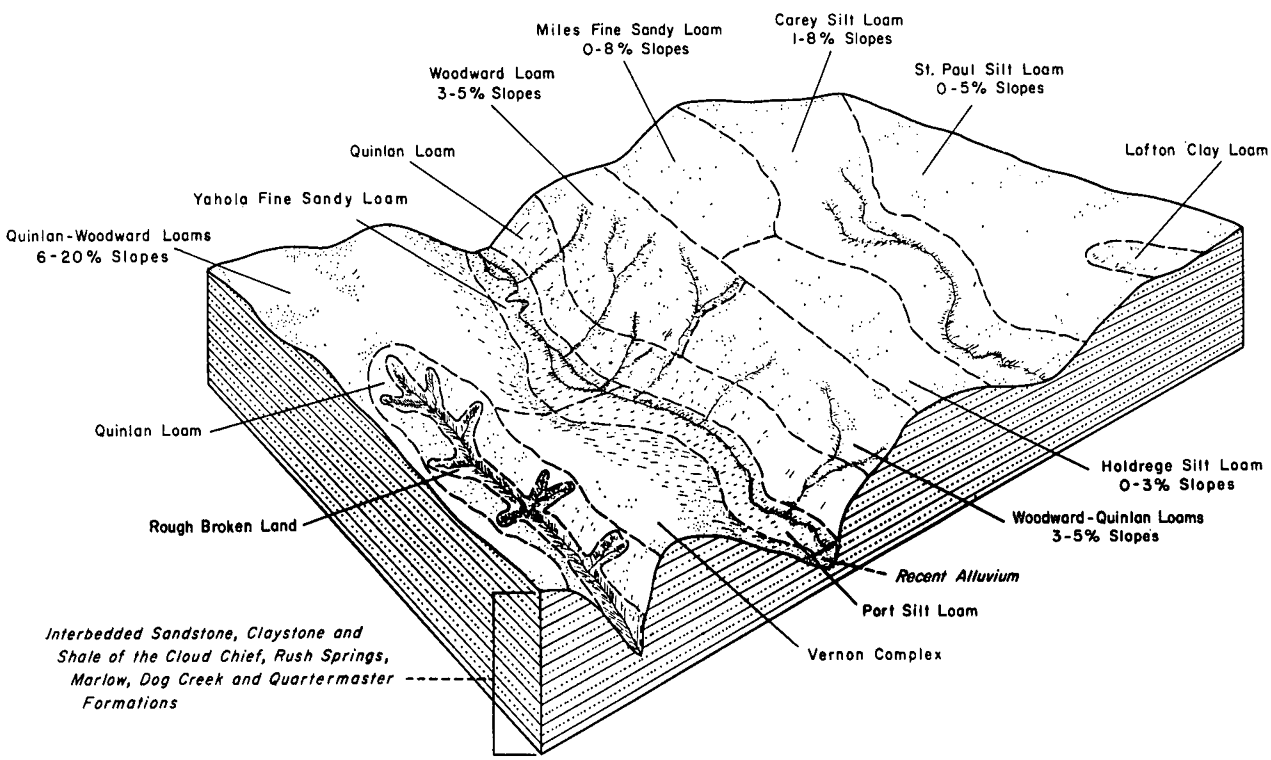

Figure 8.—**Typical pattern of the soils in associations 1 and 2.**

About 80 to 85 percent of this association is cultivated. Farms average about 320 acres in size. Wheat is the principal cash crop. Small grain and grain sorghum are grown to some extent as feed for cattle. In years of favorable rainfall, fields sown to winter wheat provide excellent pasture for beef cattle.

The soils in this association are susceptible to both wind and water erosion, but water erosion is the major problem.

2. Quinlan-Woodward association: Red-bed hills

This association consists of soils on the red-bed hills. It covers about 30 percent of the county and occurs in bands on both sides of the South Canadian River and in a large area southeast of Seiling.

Quinlan and Woodward soils are dominant. Quinlan soils are on narrow ridges or on the steep side slopes of narrow, V-shaped drains. They are reddish, somewhat excessively drained, and shallow over sandstone. Woodward soils are dark reddish brown, well drained, and moderately deep over sandstone or packsand. In parts of this association, Quinlan and Woodward soils occur as a complex and are shallow and moderately shallow. In some of these places, Quinlan soils are on ridges and Woodward soils are on strongly sloping to steep side slopes and in valleys. In other places, Quinlan soils are on steep side slopes and Woodward soils are on the toe slopes of U-shaped drains (fig. 9).

Also in this association are Rough broken land and soils of the Carey, St. Paul, Holdrege, Yahola, Vernon, and Enterprise series. Rough broken land occurs as very steep, narrow canyons at the head of drains. Figure 8 shows a typical pattern of the soils in this association and those in the St. Paul-Carey-Holdrege association.

About 98 percent of this association is in pasture. Ranching is the principal type of farming, and the ranches average about 1,200 acres in size. Most of the cultivated areas are on isolated flats that have been deeply dissected by drains. Areas cultivated are used mainly for growing grain sorghum and small grain for feed. Some strongly sloping or steep areas that have been cultivated are severely eroded. Most of these steep areas have now been reseeded to native pasture.

Figure 9.—**Woodward and Quinlan soils in foreground; Quinlan soils on side slopes of drain.**

3. Nobscot-Pratt association: Rolling and hummocky sands

This association is made up of gently sloping to steep, sandy soils on uplands and in duned areas of the north side of the South Canadian River, in the vicinity of Oakwood and Webb. It covers about 10 percent of the county. The soils are underlain by sandy deposits of the Quaternary formation. Locally, they are called "Jack soils."

Nobscot soils and the Pratt soils that have a heavy subsoil are dominant (fig. 10). Nobscot soils occur in duned areas and have a dense cover of post oak and blackjack oak. They are deep, grayish brown, and somewhat excessively drained. Their subsoil is sandy and contains lenses of sandy clay loam. Pratt soils occur on gently sloping uplands and have a scattered cover of post oak and blackjack oak. They are deep, brown to grayish brown, and well drained. On sloping to steep uplands, Nobscot and Pratt soils occur as a complex and have a moderately dense cover of oak.

The minor soils in this association are the Carwile, Miles, Pratt, Farnum, Holdrege, Enterprise, and Wann.

Beef-cattle farms are predominant in this association. About 80 percent of the association is in pasture that has a cover of oak. Although little of the acreage has been cleared, some areas have been sprayed to control the growth of oak. On most farms, cultivation has been restricted to soils of the gently sloping and sloping uplands. The principal crops are grain sorghum, small grain, and cotton. In the steeper cultivated areas, both wind and water erosion have become serious problems.

4. Miles-Pratt-Carwile association: Sandy upland flats

This association is composed of deep, nearly level to strongly sloping, moderately sandy to sandy soils on uplands that are mostly undulating and hummocky. It makes up about 5 percent of the county and is in the vicinity of Vici, Webb, and Humac. The cover is scattered and consists of sand sagebrush and a little shinnery oak.

Miles, Pratt, and Carwile soils are dominant (fig. 11). Miles soils occur on the nearly level to strongly sloping uplands. They are brown, well drained, and moderately sandy. Their subsoil is sandy clay loam. Pratt soils occur in undulating and hummocky areas, on gentle slopes along drains, and on sloping uplands. They are brown to dark brown and are somewhat excessively drained. Carwile soils are in depressions. They occur only as a complex with Pratt soils. They are grayish brown, poorly drained, and clayey. Their subsoil is mottled because of poor drainage.

The minor soils of this association are the Farnum, Nobscot, and Enterprise.

About 70 percent of this association is cultivated. The farms are between 160 and 320 acres in size and are used principally for raising beef cattle and growing wheat. Some cotton is grown. Most of the grain sorghum grown is used for feed. Small grain planted on the more clayey soils provides some winter pasture.

Both water erosion and wind erosion are serious problems. Some pastures have been overgrazed and are heavily

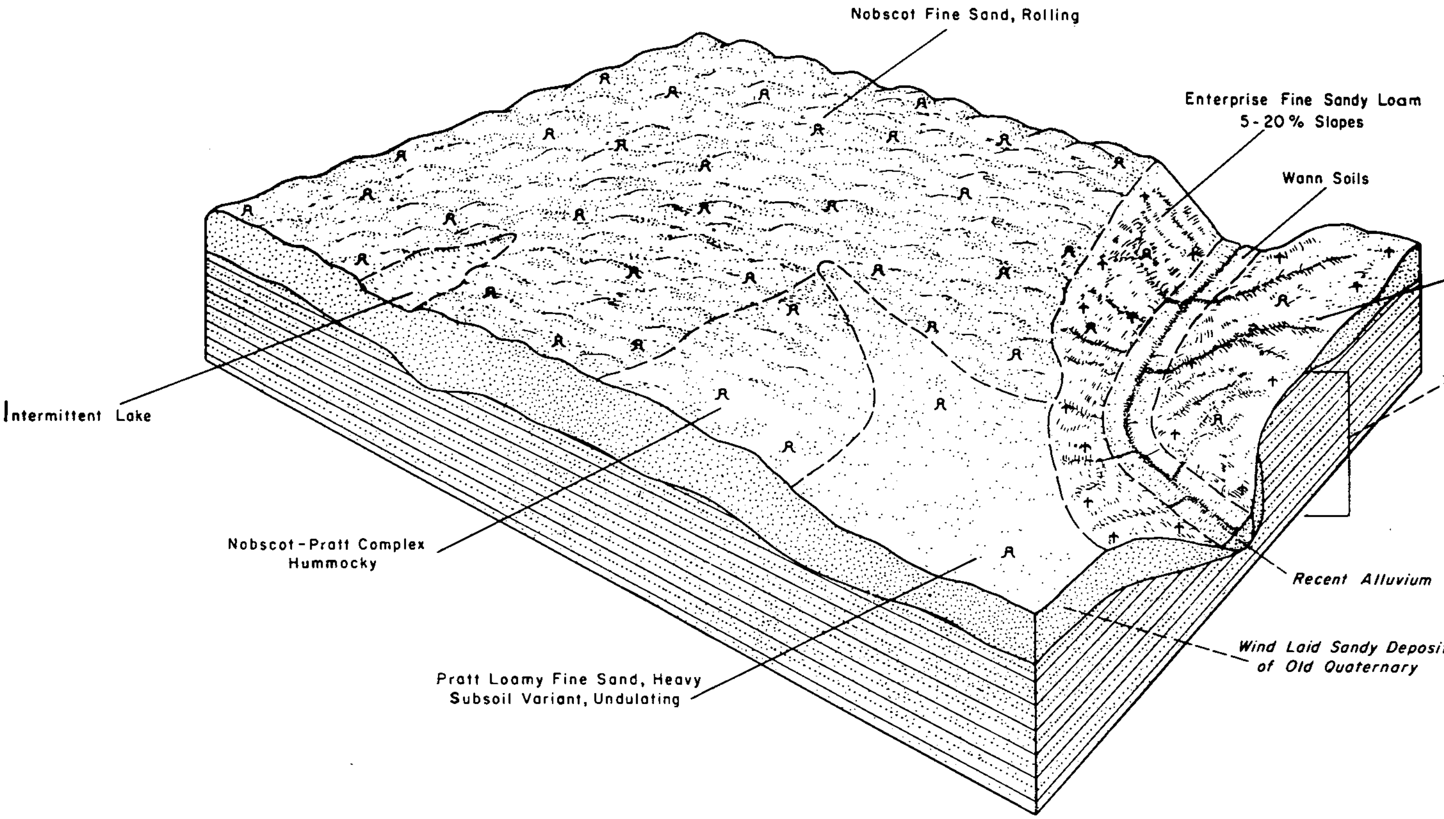

Figure 10.—Typical pattern of the dominant soils in association 3.

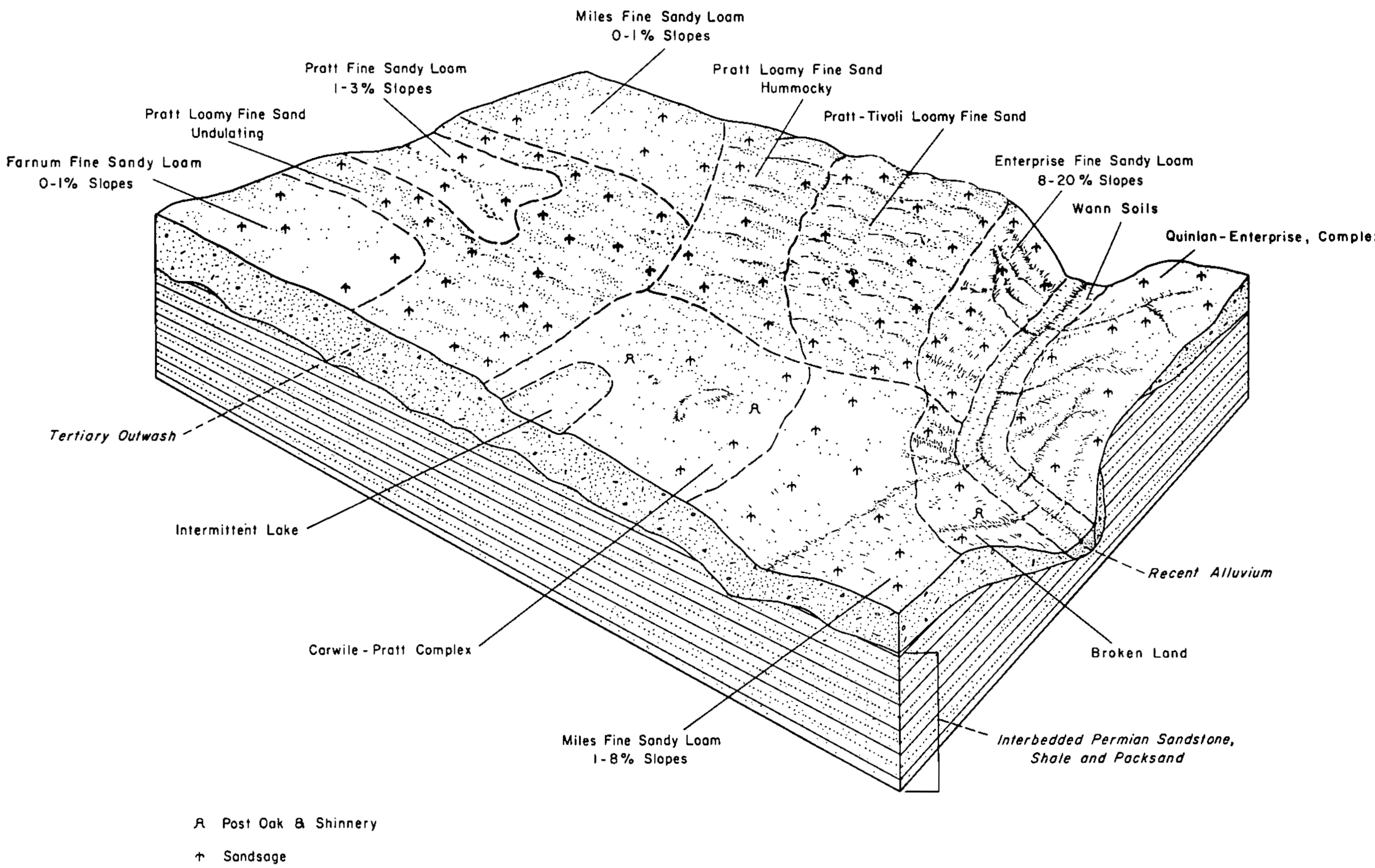

Figure 11.—**Typical pattern of the soils in association 4.**

infested with sand sagebrush. Other areas have a scattered cover of shinnery oak and post oak.

5. Tipton-Enterprise-Lincoln association: Benches and flood plains

This association is made up of soils on the benches, or terraces, along the North Canadian and South Canadian Rivers and of soils on the flood plains along these rivers. It covers about 18 percent of the county. As the distance from the river channel increases, the soils are finer textured.

The dominant soils are the Tipton, Enterprise, and Lincoln. The minor soils are St. Paul, Holdrege, Canadian, Spur, Yahola, Wann, and Tivoli soils and one land type, Alluvial land.

Lincoln, Spur, Wann, and Tivoli soils and Alluvial land are on the flood plains, 4 to 7 feet above the river channel. Holdrege, St. Paul, Tipton, Canadian, Yahola, and Enterprise soils occur on the level to nearly level terraces. Enterprise soils also occur on the sloping to strongly sloping breaks between the terraces. Figure 12 shows a typical pattern of the soils in this association.

Tipton soils are level to gently sloping, dark brown, deep, well drained, and loamy. Enterprise soils are level to strongly sloping, brown, deep, well drained, and loamy. Both the Tipton and Enterprise soils are underlain by calcareous, water-deposited, or in some places wind-deposited, loamy and silty material. Lincoln soils are sandy and are underlain by calcareous, water-deposited sandy material.

This association includes some of the most productive soils in the county. Most of it is cultivated, but pastured areas and the channels of the North Canadian and South Canadian Rivers make up about 24 percent of the total area. Farms average about 320 acres in size. Growing wheat and raising beef cattle are the principal types of farming. Fields that are sown to small grain provide winter pasture for large herds of beef cattle.

6. Pratt-Quinlan-Enterprise association: Dunes and breaks

This association consists mainly of sandy soils on dunes and moderately sandy soils on strongly sloping to steep breaks. It covers about 10 percent of the county and occurs mostly in bands on both sides of the South Canadian River and in the vicinity of Vici.

Pratt, Quinlan, and Enterprise soils are dominant. Pratt soils occur as dunes and have a cover of tall grasses and sand sage. They are deep, brown, and somewhat excessively drained. Quinlan and Enterprise soils occur as a complex on steep to very steep side slopes of drains. Quinlan soils are reddish and are shallow over sandstone. Enterprise soils are deep, well drained, brown, and moderately sandy; they are underlain by calcareous, water-deposited or wind-deposited material that originated on the high plains.

The Wann, Miles, and Holdrege soils are minor soils in this association, and Broken land is also included. Wann

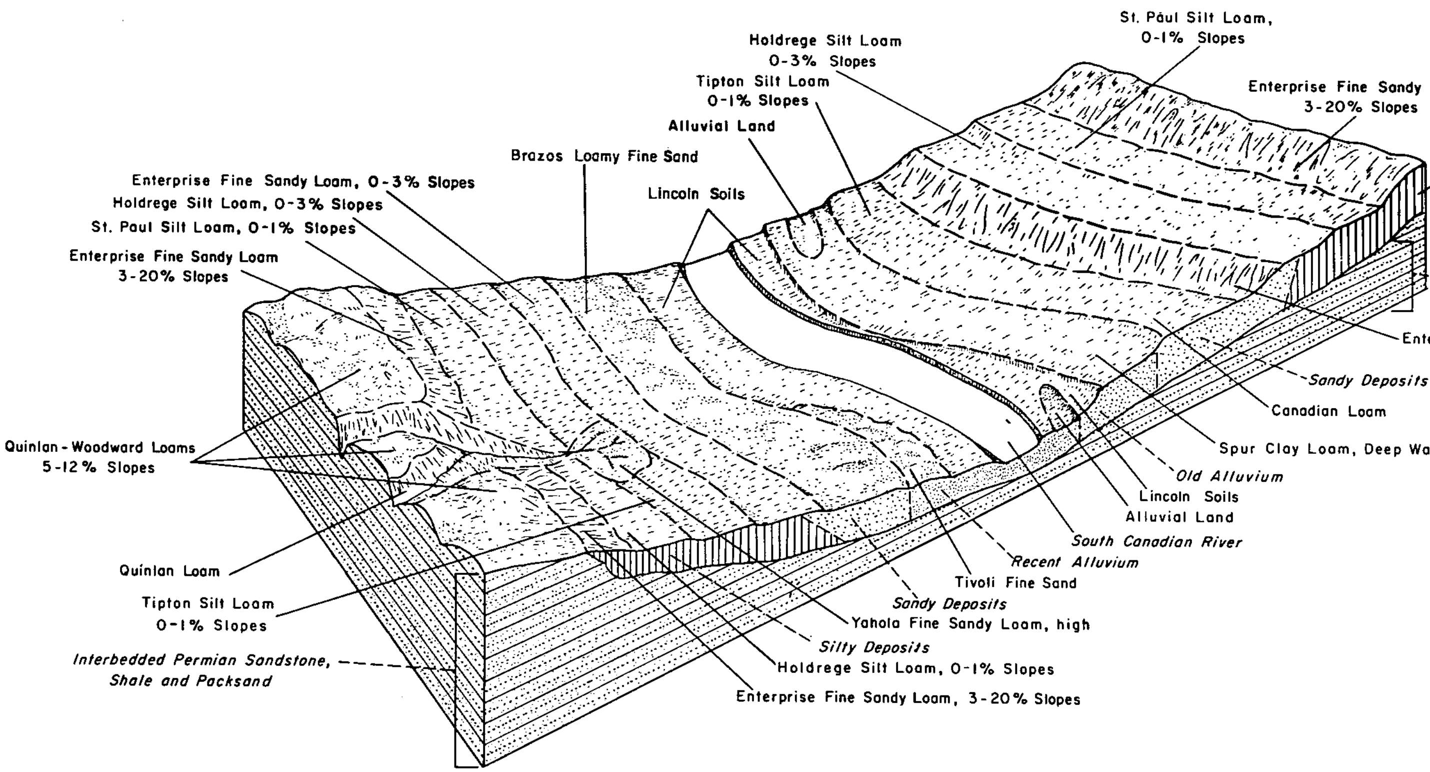

Figure 12.—Typical pattern of most of the soils in association 5.

soils are along local drains and are occasionally overflowed. Broken land occurs on steep to very steep side slopes of drains that dissect the sandy uplands.

Raising beef cattle is the principal source of income, and about 95 percent of the association is in pasture. Farms are between 640 and 800 acres in size. Grain sorghum and small grain are grown along small drains and on small, isolated flats that are deeply dissected by drains. These crops are used mainly for feed. Overgrazed areas generally have a dense cover of sand sagebrush and some shinnery oak and post oak. Some overgrazed areas are severely eroded.

7. *Woodward-Dill-Miles association: Sandy uplands and red-bed hills*

This association is made up of nearly level to steep soils on dissected uplands. It makes up about 3 percent of the county and occurs in the eastern part along the Dewey and Blaine county line.

The soils in this association occur in very complex patterns. Woodward, Dill, and Miles soils are dominant. Woodward soils occur on sloping uplands and are moderately deep, reddish brown, well drained, and loamy. Dill soils occur on gently sloping to strongly sloping uplands and are deep, reddish brown, well drained, and moderately sandy. Woodward and Dill soils also occur as a complex on high, nearly level to sloping terraces along the North Canadian River. Both the Woodward and Dill soils developed over weathered sandstone and packsand. Miles soils occur on gently sloping to strongly sloping uplands and are deep, brown, well drained, and moderately sandy. They have a subsoil of sandy clay loam and are underlain by sandy deposits.

The minor soils in this association are the Yahola, St. Paul, Carey, Pratt, Nobscot, Enterprise, Quinlan, Tivoli, Farnum, and Carwile. Carwile and Pratt soils occur in a complex on high terraces along the North Canadian River and on nearly level to sloping uplands. Quinlan soils occur in a complex with Woodward soils on the sloping to steep sides of drains that dissect nearly level to sloping uplands. Tivoli soils are in hummocky and duned areas.

About 70 percent of this association is cultivated. Farms are between 320 and 480 acres in size and are principally of the wheat and beef-cattle type. Some cotton is grown. Small grain and grain sorghum are the main cash crops. Part of the grain sorghum is used for feed or for silage. In years of favorable rainfall, fields sown to small grain provide winter pasture for beef cattle.

Both wind and water erosion are serious problems on the soils in this association. Pastures contain a mixture of mid and tall grasses and some scattered sand sagebrush, post oak, and shinnery oak.

Descriptions of Soils

In this section the soil series in Dewey County are described. Following the general description of each series, there is a discussion of each soil, or mapping unit, in the series, including comments on their management. Further information on the use and management of the soils for both crops and range is given in the section "Use and Management of Soils." A profile of a typical soil of each series is described in detail in the section "Genesis, Morphology, and Classification of Soils." Terms used to describe the soils are defined in the Glossary.

A list showing the soils mapped in the county and the capability unit and range site of each is near the back of the report. The approximate acreage and proportionate extent of the soils are given in table 5. The location and distribution are shown on the soil map at the back of the report.

Alluvial Land

Alluvial land consists of dark-colored soils that have a fine-textured surface layer and a wet, mottled sandy subsoil. It occurs on broad, level flood plains and is occasionally overflowed. The water table is within 3 or 4 feet of the surface. It supplies water to the long, narrow, shallow lakes that are common in these areas.

The surface layer is 5 to 10 inches of dark-colored, granular silty clay loam that is high in content of organic matter.

The subsoil, which extends to a depth of about 24 inches, is light-colored, granular, mottled loam or sandy loam. It is stratified and contains many crystals of gypsum. Because of the high water table, it is poorly drained.

The parent material consists of mixed, recently deposited alluvium. In most places it is stratified and faintly mottled. The texture varies but generally is a calcareous fine sand.

The soils in this unit are more mottled and more coherent than Lincoln soils. They are mottled nearer the surface than Wann soils and are shallower over sand.

Alluvial land is productive if used for pasture and meadow plants but is of limited use for cultivated crops because of the high water table. The soils are slightly saline in places, but not saline enough to limit the growth of native plants. Tall grasses, salt-tolerant grasses, and sedges are the predominant vegetation.

Alluvial land (Ad).—This land type occurs on nearly level bottom lands along the North Canadian and South Canadian Rivers. There are large areas east of Seiling and west of Camargo. Occasionally, this land is overflowed.

Most of the acreage is in pasture, and the production of native grasses is high. During periods of drought, cultivated crops can be successfully grown, but in most years the water table is too high. *Capability unit Vw-1; Subirrigated range site.*

Brazos Series

The Brazos series is made up of sandy soils that are deeply stained with organic matter. They occur on bottom lands but above the normal overflow of streams. They consist of mixed, water-deposited material.

The surface layer is about 20 inches of brown or dark-brown loamy fine sand. It is neutral in reaction, granular, and loose to very friable.

The subsoil, which extends to a depth of about 40 inches, consists of reddish-yellow loamy sand. It is structureless, loose, and in many places weakly calcareous. The lower part is weakly stratified.

TABLE 5.—*Approximate acreage and proportionate extent of soils mapped*

Soil	Acres	Percent
Alluvial land	3, 801	0. 6
Brazos loamy fine sand	1, 834	. 3
Broken land	2, 120	. 3
Canadian loam	2, 133	. 3
Carey silt loam, 1 to 3 percent slopes	17, 405	2. 8
Carey silt loam, 3 to 5 percent slopes	32, 266	5. 2
Carey silt loam, 5 to 8 percent slopes	8, 598	1. 4
Carwile-Pratt complex	9, 440	1. 5
Dill fine sandy loam, 1 to 5 percent slopes	1, 662	. 3
Dill fine sandy loam, 3 to 8 percent slopes, eroded	1, 110	. 2
Dill fine sandy loam, 5 to 8 percent slopes	682	. 1
Enterprise very fine sandy loam, 0 to 1 percent slopes	4, 764	. 8
Enterprise very fine sandy loam, 1 to 3 percent slopes	8, 477	1. 4
Enterprise fine sandy loam, 0 to 3 percent slopes	4, 820	. 8
Enterprise fine sandy loam, 3 to 5 percent slopes	15, 153	2. 4
Enterprise fine sandy loam, 5 to 8 percent slopes	11, 240	1. 8
Enterprise fine sandy loam, 8 to 20 percent slopes	28, 601	4. 6
Eroded sandy land	1, 848	. 3
Farnum fine sandy loam, 0 to 1 percent slopes	2, 293	. 4
Holdrege silt loam, 0 to 1 percent slopes	6, 203	1. 0
Holdrege silt loam, 1 to 3 percent slopes	7, 101	1. 1
Lincoln soils	10, 755	1. 7
Lofton clay loam	410	. 1
Miles fine sandy loam, 0 to 1 percent slopes	729	. 1
Miles fine sandy loam, 1 to 3 percent slopes	11, 682	1. 9
Miles fine sandy loam, 1 to 3 percent slopes, eroded	1, 431	. 2
Miles fine sandy loam, 3 to 5 percent slopes	6, 572	1. 0
Miles fine sandy loam, 3 to 5 percent slopes, eroded	2, 662	. 4
Miles fine sandy loam, 5 to 8 percent slopes	2, 362	. 4
Miles fine sandy loam, 5 to 8 percent slopes, eroded	870	. 1
Nobscot fine sand, rolling	35, 137	5. 6
Nobscot-Pratt complex, hummocky	19, 733	3. 2
Port silt loam	1, 470	. 2
Pratt fine sandy loam, 1 to 3 percent slopes	5, 943	. 9
Pratt loamy fine sand, undulating	1, 745	. 3
Pratt loamy fine sand, hummocky	9, 367	1. 5
Pratt-Tivoli loamy fine sands	11, 142	1. 8
Pratt loamy fine sand, heavy subsoil variant, undulating	5, 340	. 9
Quinlan loam	39, 418	6. 3
Quinlan soils, severely eroded	6, 488	1. 0
Quinlan-Enterprise complex	24, 997	4. 0
Quinlan-Woodward loams, 3 to 5 percent slopes, eroded	15, 400	2. 5
Quinlan-Woodward loams, 5 to 20 percent slopes	112, 934	18. 1
Rough broken land	2, 120	. 3
St. Paul silt loam, 0 to 1 percent slopes	5, 672	. 9
St. Paul silt loam, 1 to 3 percent slopes	41, 341	6. 6
St. Paul silt loam, 3 to 5 percent slopes	18, 408	2. 9
St. Paul clay loam, 3 to 5 percent slopes, eroded	4, 016	. 6
Spur clay loam, deep water table	1, 258	. 2
Tipton silt loam, 0 to 1 percent slopes	1, 634	. 3
Tivoli fine sand	3, 630	. 6
Vernon soils, severely eroded	372	. 1
Vernon complex	2, 363	. 4
Wann soils	4, 325	. 7
Woodward loam, 3 to 5 percent slopes	3, 856	. 6
Woodward-Carey complex, 1 to 3 percent slopes	1, 888	. 3
Woodward-Carey complex, 3 to 5 percent slopes, eroded	8, 903	1. 4
Woodward-Carey complex, 5 to 8 percent slopes, eroded	2, 691	. 4
Woodward-Dill fine sandy loams, 0 to 3 percent slopes	3, 856	. 6
Woodward-Quinlan loams, 3 to 5 percent slopes	4, 952	. 8
Yahola fine sandy loam, high	5, 862	. 9
Yahola fine sandy loam	9, 995	1. 6
Total land	625, 280	100. 0
Rivers	25, 049	
Total area	650, 329	

The substratum is stratified fine sand. It is loose, structureless, and slightly calcareous. The sand grains are clean and are uniform in size. The water table is within reach of deep-rooted crops.

These soils are more sandy and lighter colored than Canadian soils and more sandy and less red than Yahola soils.

Brazos soils are low to moderate in fertility. If overtilled they are pulverized readily. They are susceptible to severe wind erosion.

There is only one Brazos soil in Dewey County. It is used principally for cultivated crops.

Brazos loamy fine sand (Bf).—This soil is on broad, undulating bottom lands but is seldom overflowed. It occurs mostly along the North Canadian and South Canadian Rivers. It absorbs water readily but is low in water-holding capacity.

The principal crops are small grain, sorghum, alfalfa, and temporary pasture plants. If this soil is used for range, the production of forage is high. *Capability unit IIIe-3; Sandy Bottom Land range site.*

Broken Land

Broken land (Br).—This land type occurs on the steep side slopes and narrow bottom lands of drains that have cut 60 to 100 feet into the sandy uplands in the northwestern part of the county. The soil materials are so geologically eroded and so mixed that they are difficult to identify. Generally they are calcareous, but noncalcareous materials are not uncommon. The surface layer ranges in texture from loamy fine sand to loam but is predominantly sandy loam. Gravel commonly is scattered throughout the surface layer and is found in large quantities on high, isolated knobs.

Except for small spots, this land type is not suited to cultivation. It will support a good growth of tall native grasses. Existing vegetation consists mostly of trees and tall grasses. Redcedar and some shinnery oak grow on the side slopes. Deciduous trees and cedar grow on recently deposited sediments. *Capability unit VIe-2; Sandy Prairie range site.*

Canadian Series

Soils of the Canadian series are dark brown and loamy. They consist of water-deposited material. These soils are on bottom lands that normally are not overflowed.

The surface layer is 30 inches of dark-brown loam. It is granular, friable, and noncalcareous.

The subsoil, which generally extends to a depth of about 40 inches, is dark-brown loam. It is friable, weakly stratified, and, normally, noncalcareous. It is granular when moist and prismatic when dry.

The substratum is light-brown to dark-brown loam that is lighter colored, more sandy, and more stratified with depth. It is calcareous at a depth of about 50 inches.

These soils are less calcareous than Wann soils, less red than Yahola soils, less sandy than Brazos soils, and more stratified than Tipton and Enterprise soils.

Only one Canadian soil is mapped in Dewey County. This soil is fertile and is easily tilled. Wind erosion is a slight hazard, and runoff from higher areas is sometimes a problem. Excessive tillage will pulverize the soil and increase the erosion hazard. A plowpan is likely to form if the depth of tillage is not varied. Most of the acreage is in crops, principally small grain and alfalfa. On the small acreage used for range, the production of forage is consistently high.

Canadian loam (Ca).—This soil is on level bottom lands that are seldom overflowed. It occurs mostly on terraces along the larger tributaries, but a few broad areas are along the North Canadian and South Canadian Rivers. Very fine sandy loam makes up from 5 to 10 percent of some areas. *Capability unit I–1; Loamy Bottom Land range site.*

Carey Series

The Carey series consists of deep, reddish-brown, gently sloping to strongly sloping silty soils that occur on broad uplands. The parent material was calcareous silty sandstone or sandy shale, and the native cover was mixed grasses.

The surface layer is about 16 inches of reddish-brown silt loam. It is granular, slightly hard when dry, and friable when moist.

The subsoil is about 30 inches of reddish-brown, prismatic silt loam or clay loam. It is readily penetrated by water and by plant roots. The upper part has pronounced prismatic structure when dry. The lower part is more red and in many places contains free lime.

The substratum is partly weathered, calcareous, fine-grained sandstone or shale. In places, some lime has accumulated in the upper part.

Carey soils are less red in the surface layer than Woodward and Quinlan soils, and they have a more clearly defined subsoil. They are redder than St. Paul soils, and they are lighter colored in the surface layer and in the upper part of the subsoil.

Carey soils occur throughout the red-bed areas in the central and southern parts of this county. They are among the most productive soils in the county. Wheat and sorghum are the principal crops, but other crops common in the area can be grown. Yields are good. Range vegetation consists mostly of mid and tall grasses. If these soils are tilled excessively, the structure of the surface layer breaks down and a surface crust forms after rains. Wind erosion is only a slight hazard, but water erosion is a serious hazard on the steeper soils.

Carey silt loam, 1 to 3 percent slopes (CeB).—This soil is on gentle, convex slopes on the uplands. In some of the lower areas, the surface layer is somewhat darker colored than is typical.

This soil is suited to irrigation. Small grain and sorghum are well suited, and alfalfa can be grown in years of normal rainfall. Excessive tillage causes the surface to crust after rains. Water erosion is a slight hazard. *Capability unit IIe–1; Loamy Prairie range site.*

Carey silt loam, 3 to 5 percent slopes (CeC).—This soil occurs on convex slopes on the uplands. It covers about 5 percent of the county. Inclusions of St. Paul and Woodward soils make up as much as 10 percent of this mapping unit.

This soil is moderately susceptible to water erosion and tends to crust after rains. Because of prevailing climatic conditions, the choice of crops is limited. Small grain and sorghum are well suited, and cotton is grown in the southwestern part of the county. Native grasses produce a dense cover. *Capability unit IIIe–1; Loamy Prairie range site.*

Carey silt loam, 5 to 8 percent slopes (CeD).—This soil occurs as narrow bands on rough, steeply sloping breaks from more nearly level Carey soils. The surface layer is only about 11 inches thick. On the steeper breaks, inclusions of Woodward and Quinlan soils make up as much as 10 percent of this mapping unit.

This soil is used primarily for livestock pasture. Its use for cultivated crops is limited because of the severe hazard of water erosion and the tendency of the surface layer to crust after rains. Small grain, sown sorghum,[3] and clover are the principal crops. Row crops are not suitable. Yields of forage are high. *Capability unit IVe–1; Loamy Prairie range site.*

Carwile Series

The Carwile series is made up of somewhat poorly drained soils that have a dark-colored, medium-textured surface layer and a mottled, compact subsoil. These soils are in depressions on sandy uplands. The native cover consists of tall grasses, some water grasses, and alkali sacaton.

The surface layer is 10 to 14 inches of grayish-brown sandy loam to clay loam. It is granular, hard to slightly hard when dry, and generally high in content of organic matter.

The subsoil, which extends to a depth of about 46 inches, is often saturated for several months at a time. The upper part is brown to dark-brown, mottled, prismatic heavy sandy clay loam that is hard when dry. Roots are numerous and are most prominent along prism faces. The prisms are coated with fine, organic films. The lower part of the subsoil is light brownish-gray to light yellowish-brown, prismatic, compact sandy clay mottled with reddish yellow, dark gray, and reddish brown. It is ex-

[3] Sorghum planted in closely spaced rows for forage production.

tremely hard when dry and becomes more yellowish or reddish with depth. The few roots in this part of the subsoil are mostly on the surfaces of prisms. Prisms are coated with weak clay films and organic films.

The parent material is sandy clay or heavy sandy clay loam that forms a thin mantle over the red beds. This material was deposited by wind and water and commonly is mottled and noncalcareous. In many broad areas, the depth to the red beds is 12 feet or less. In small isolated areas, the depth to the red beds generally is much greater.

Carwile soils normally have a darker colored, more clayey surface layer than Pratt and Miles soils, and they have a clayey, mottled subsoil. They have a thinner, less sandy surface layer than Nobscot soils.

In Dewey County, Carwile soils occur in areas where intermittent lakes are common. They are mapped as a complex with Pratt soils. Yields of cultivated crops are generally good, but in low spots crops are often killed by standing water. Small grain and sorghum are well suited. In the few remaining areas of grassland, the production of forage is good.

Carwile-Pratt complex (Cp).—These soils occur in the northeastern part of the county, on broad, gently sloping uplands that are characterized by mounds, depressions, and potholes. Some small depressed areas occur as inclusions in larger areas of sandy soils.

Pratt soils make up from 15 to 20 percent of this mapping unit. They occur only on low mounds. Carwile soils may be on any type of topography but are most likely to occur on long, gentle slopes and in depressions. Many low spots are mapped as intermittent lakes, but from 5 to 10 percent of the acreage may be under water a third of the time.

Most of the acreage is in crops, principally wheat and grain sorghum. Wind erosion is a hazard if the soils are excessively tilled. If the depth of tillage is not varied, a plowpan is likely to form. Occasionally, tillage is delayed because of excess water. Tall native grasses grow well. *Capability unit IIIw-1; Sandy Prairie range site.*

Dill Series

Soils of the Dill series are moderately sandy, slightly acid, reddish, and well drained. They have no zone in which calcium carbonate has accumulated. They are on nearly level to strongly sloping uplands. The original cover was native grasses.

The surface layer is about 9 inches of reddish-brown fine sandy loam. It is weakly granular to structureless and is slightly acid.

The subsoil, which extends to a depth of about 22 inches, is red, friable, slightly acid, prismatic fine sandy loam that is redder with depth. It is readily penetrated by both roots and water.

The parent material is red or light-red, noncalcareous, highly weathered, soft, fine-grained packsand. It is porous and is readily penetrated by both roots and water.

Dill soils have a redder surface layer than Miles soils and a less clayey subsoil. They are reddish, whereas Pratt soils are brownish. They are less clayey than Carey soils, and they formed from noncalcareous parent material.

Dill soils are in the eastern part of the county. They are susceptible to both wind and water erosion. Most of the acreage has been cultivated at some time, and the more sloping soils have lost a large part of their original surface layer through erosion. Excessive tillage pulverizes these soils and increases the erosion hazard. Seedlings in pulverized areas are often killed by blowing sand. Small grain and sown sorghum are the principal crops. Tall native grasses grow well.

Dill fine sandy loam, 1 to 5 percent slopes (DfC).—This soil is on convex slopes that commonly are dissected by field drainageways. The surface layer generally is about 12 inches thick but is thicker in valleys and thinner on knobs.

Small grain is the principal crop. Both wind and water erosion are moderate hazards. Consequently, excessive tillage should be avoided because it will pulverize the surface soil and increase the erosion hazard. *Capability unit IIIe-2; Sandy Prairie range site.*

Dill fine sandy loam, 3 to 8 percent slopes, eroded (DfD2).—This soil is on eroded, convex slopes on the uplands. The surface layer is about 6 inches thick, or less, and is loose and noncoherent because of the loss of organic matter. The subsoil is about 15 inches thick. In some shallow gullies and on knobs, all of the original surface layer has been removed by erosion and the subsoil is exposed.

Grass is the best use for this soil, but some small grain and sown sorghum are grown. Clover generally does well; it grows wild in some areas that are reverting to grass. This soil is low in natural fertility but responds to fertilization. If overtilled, it is readily pulverized. *Capability unit IVe-2; Sandy Prairie range site.*

Dill fine sandy loam, 5 to 8 percent slopes (DfD).—This soil occurs on convex slopes on the uplands. The surface layer is about 10 inches thick, and the subsoil is about 21 inches thick. The total acreage is small, but individual areas are fairly large.

Little of this soil is cultivated. Its best use is range. Shinnery oak and sand sagebrush are scattered throughout the vegetative cover. In higher lying areas the cover consists mostly of oak, and in lower lying areas it consists mostly of tall grasses. *Capability unit IVe-2; Sandy Prairie range site.*

Enterprise Series

In the Enterprise series are deep, brown, silty and moderately sandy soils that consist of wind-deposited and water-deposited materials. These soils are on the level to sloping terraces along rivers and on the bordering level to steeply sloping uplands. They are from 20 to 300 feet above the river bed. The original cover consisted of tall native grasses.

The surface layer is about 26 inches of dark-brown to light-brown, friable very fine sandy loam or fine sandy loam that is neutral to mildly alkaline. Normally it is granular, but it tends to crust readily after heavy rains.

The subsoil, which extends to a depth of about 48 inches, is light-brown very fine sandy loam or fine sandy loam. It has weak prismatic structure but breaks to moderate granular structure. It is friable when moist and is strongly calcareous. Plant roots are abundant in this layer.

The parent material consists of old, calcareous, light-colored sandy and silty materials that have been deposited by both wind and water but predominantly by wind.

These soils are associated with Tipton and Holdrege soils. They are less well developed than Tipton and Holdrege soils, and they have a less clayey subsoil. Enterprise soils are older and more silty than Tivoli soils, and they are more calcareous and generally more silty than Pratt soils.

In Dewey County, Enterprise soils occur along the North Canadian and South Canadian Rivers. Large areas are on the JV Flats, which are west of Taloga, and on the Trail Flats, which are near Trail. Inclusions of Tipton soils occur in some small concave areas. Most of the less sloping areas are cultivated. The steeper areas are used for permanent pasture. Wheat is the principal cultivated crop, and tall native grasses are the best suited forage plants. Water and wind erosion are slight to moderate hazards. Excessive tillage will pulverize these soils and make them more susceptible to wind erosion.

Enterprise very fine sandy loam, 0 to 1 percent slopes (EnA).—This soil is on level and nearly level terraces along the North Canadian and South Canadian Rivers. It occurs as broad, level bands on the JV and Trail Flats, where it is associated with Tipton soils. It is readily penetrated by both plant roots and water and is highly productive. The upper part of the surface layer generally is neutral in reaction.

Most of the acreage is cultivated. Wheat, alfalfa, and cotton are the principal crops, but other small grain, sorghum, and sudan are also grown. Mid and tall native grasses grow only in stomp lots or in small, irregular areas.

Erosion normally is not a serious hazard. At times, however, runoff from higher areas is a problem. Improper tillage can cause crusting of the surface layer and the formation of a plowpan. *Capability unit IIc–1; Loamy Prairie range site.*

Enterprise very fine sandy loam, 1 to 3 percent slopes (EnB).—This soil occurs mainly on gently sloping terraces along the South Canadian River and is extensive on the JV and Trail Flats, where it is associated with Tipton soils. It is readily penetrated by both plant roots and water. The surface layer is about 22 inches thick and is neutral to calcareous.

Most of the acreage is cultivated. Wheat and alfalfa are the principal crops, but other small grain, sorghum, cotton, sudan, and legumes are also grown.

Erosion is a hazard only during hard rains or in periods of drought. The tendency of the surface to crust after rains is increased if the soil is pulverized by excessive tillage. A plowpan is likely to form unless the depth of tillage is varied. At times, runoff from higher areas is a problem. *Capability unit IIe–1; Loamy Prairie range site.*

Enterprise fine sandy loam, 0 to 3 percent slopes (EfB).—This soil is on uplands that border terraces paralleling the North Canadian and South Canadian Rivers. The relief is uneven and knobby, but there are no well-defined drains. The surface layer is calcareous. The subsoil is rapidly permeable. Associated soils are those of the Tipton series and the less sandy Enterprise soils.

This soil is well suited to most crops commonly grown in the area. It is not readily affected by drought and consequently can be used for summer-growing crops. Much of the acreage is in small grain, cotton, alfalfa, and sorghum. The rest is in permanent pasture consisting of tall grasses.

Wind erosion is a serious hazard if this soil is tilled. In places the surface layer is winnowed; that is, some of the fine soil particles have been removed by wind. Tillage that will pulverize the surface soil is not suitable. *Capability unit IIIe–4; Sandy Prairie range site.*

Enterprise fine sandy loam, 3 to 5 percent slopes (EfC).—This soil occurs on uplands that are between the river valleys and the higher uplands. It slopes consistently in one direction. The surface layer is 20 to 36 inches thick and is calcareous. The subsoil is rapidly permeable. Associated soils are Holdrege soils and the more steeply sloping Enterprise soils.

This soil can be used for both crops and permanent pasture. Small grain, sown sorghum, and legumes, such as clover and vetch, are the best suited cultivated crops. Tall native grasses also grow well.

This soil absorbs water readily but is somewhat limited in its capacity to store moisture. It is moderately to highly susceptible to both wind and water erosion. Plans for a cropping system should be kept flexible so that they can be changed if climatic or economic conditions vary. *Capability unit IIIe–2; Sandy Prairie range site.*

Enterprise fine sandy loam, 5 to 8 percent slopes (EfD).—This soil occurs on strong slopes between the river valleys and the uplands. It slopes consistently in one direction. The surface layer is about 20 inches thick and is calcareous. The subsoil is rapidly permeable. Associated soils are Holdrege soils and other Enterprise soils.

This soil is best suited to range. The production of tall native grasses is high. If the soil is well managed, yields of cultivated crops are fair. Rye, sudan, and legumes, such as sweetclover, vetch, and cowpeas, are best suited, but wheat, barley, and sown sorghum can be grown.

Water erosion is a severe hazard, and wind erosion is a moderate hazard. Consequently, any plans to cultivate this soil should include a moisture-conservation and soil-improving program. Plans for a cropping system should be flexible so that they can be changed if climatic or economic conditions vary. *Capability unit IVe–2; Sandy Prairie range site.*

Enterprise fine sandy loam, 8 to 20 percent slopes (EfE).—This soil is on steep and very steep breaks that are dissected by numerous well-defined drains. The surface layer ranges from fine sandy loam to loamy fine sand but is mostly fine sandy loam. It is about 15 inches thick and is neutral to calcareous. The subsoil is rapidly permeable. Associated soils are those of the Pratt series and other Enterprise soils.

All of the acreage is in permanent pasture. The native cover is principally big and little bluestem, side-oats grama, and Indiangrass, but shorter grasses, sand sagebrush, and skunkbush invade pastures that are overgrazed. *Capability unit VIe–2; Sandy Prairie range site.*

Eroded Sandy Land

Eroded sandy land (Er).—This land type consists of severely eroded areas on the sandy uplands. It is most extensive in the vicinity of Oakwood and Webb. Some areas are field size, but most areas are small. The original soils were members of the Pratt, Miles, Enterprise, and Nobscot series.

Much of this land was eroded by water. In these areas about 20 percent of the acreage consists of gullies that are from 3 to 12 feet deep and from 6 to 20 feet wide. The soil remaining between the gullies has little normal horizonation and ranges in texture from sandy loam to light sandy clay loam. Generally, it is calcareous to slightly acid.

Areas eroded predominantly by wind consist mostly of hummocks and dunes intermingled with wind-scoured spots. Commonly, these areas are noncalcareous and are more sandy than those eroded by water.

It would be impractical to attempt to cultivate any of this land. Its reclamation presents many problems, but revegetation is the foremost need. Coarse grasses are the first plants to become reestablished. *Capability unit VIe-8; Eroded Sandy Land range site.*

Farnum Series

The Farnum series is made up of deep, dark-colored, friable, nearly level soils that have a moderately sandy surface layer and a fine-textured, grayish, fairly compact subsoil. These soils occur on high uplands that have a mantle of old, water-deposited material. The original cover was tall native grasses.

The surface layer is about 20 inches of grayish-brown or dark-brown fine sandy loam to very fine sandy loam that is friable when moist. It is granular and absorbs water readily.

The subsoil, which is about 40 inches thick, ranges from firm, subangular blocky light clay loam to very firm, blocky heavy silty clay loam or clay loam. It is slowly permeable but is penetrated by many small roots. It is high in moisture-holding capacity. The lower part of the subsoil is mottled. It is more sandy than the upper part and is friable when moist. When the surface layer is depleted of moisture, plants usually can obtain moisture from the subsoil.

The parent material consists of deep, old, water-laid deposits. It generally is bright reddish-brown or yellowish-brown to gray sandy loam. It is noncalcareous except in places where the mantle is close to the red beds.

These soils have a more sandy surface layer than St. Paul soils, and they are noncalcareous in the lower part of the subsoil and in the parent material. They have a deeper, darker colored surface layer than Miles soils and a less red, more clayey subsoil.

There is only one Farnum soil mapped in Dewey County. This soil occurs in the eastern part. It is free of inclusions, except for some spots of Carwile soils in depressions and some overburden of alluvial material. In places, the subsoil is more mottled than is typical.

This soil is easily cultivated, but excessive tillage may cause the surface to crust after rains. A plowpan is likely to form unless the depth of tillage is varied. Wind erosion is a slight to moderate hazard. Yields of wheat, sorghum, and alfalfa are consistently high. Grass production is also high.

Farnum fine sandy loam, 0 to 1 percent slopes (FaA).—This soil occurs on the nearly level, broad upland flats north of Oakwood. The surface normally is smooth, but there are some 3- to 6-foot breaks in the elevation. Associated soils are those of the Pratt, Nobscot, and Miles series.

Wheat is extensively grown. Native grasses do well on the small acreage used for pasture. Water often ponds on this soil for a few days after heavy rains. *Capability unit IIe-2; Sandy Prairie range site.*

Holdrege Series

In the Holdrege series are deep, dark-colored, well-drained silty soils that consist of both wind-deposited and water-deposited materials. These soils occur on level to gently sloping old river terraces. The original cover was principally tall native grasses.

The surface layer is 20 inches of brown to very dark grayish-brown, friable silt loam that is neutral to slightly acid. Normally, it is granular, but it may crust after heavy rains or if it is tilled when wet.

The subsoil, which extends to a depth of about 50 inches, is brown or dark-brown clay loam or loam. It is prismatic in structure but breaks to granular. The reaction is neutral to slightly calcareous. Plant roots are abundant in this layer.

The parent material is principally old, calcareous, stratified, water-laid deposits, but it also includes some wind-deposited sand and silt. The color commonly is brown or strong brown.

Holdrege soils are more sandy and less well developed than St. Paul soils. They are less red than Carey soils, and they are better developed and less calcareous than Enterprise soils. They are less sandy and darker colored than Miles soils. Their water table is at a greater depth than that of Tipton soils.

In Dewey County, Holdrege soils occur along the North Canadian and South Canadian Rivers. Some areas are in the present river valleys, and others are on adjoining upland flats. Broad areas occur on the JV and Trail Flats. Inclusions of Enterprise soils occur in small, weakly convex areas on the larger flats.

Holdrege soils are among the more productive soils in the county. They are easily worked, absorb moisture readily, and store sufficient moisture and nutrients in the subsoil for plant growth. Some wind erosion does occur, but water erosion is more common. Wheat, cotton, sorghum, and alfalfa are grown extensively. Tall native grasses grow well on the small acreage that remains in range.

Holdrege silt loam, 0 to 1 percent slopes (HoA).—This soil occurs mostly in valleys along the North Canadian and South Canadian Rivers. Small areas also occur some 300 feet above the flood plains. The relief is nearly level, but there are scattered depressions.

This soil is used principally for wheat and alfalfa. Yields of most crops are high. The production of forage is high in areas used for range. Erosion is only a slight hazard, although runoff from higher areas is sometimes a problem. The surface layer often crusts after rains if it has been tilled excessively. Varying the depth of tillage will help to prevent the formation of a plowpan. *Capability unit IIc-1; Loamy Prairie range site.*

Holdrege silt loam, 1 to 3 percent slopes (HoB).—This soil occurs on long, gentle slopes. Some areas are on terraces parallel to the flood plains along the North Canadian and South Canadian Rivers; others are on upland flats, some 300 feet above the flood plains.

Wheat is the principal crop, but yields of most crops are good. The production of perennial grasses is high in areas used for pasture or range. This soil tends to crust after rains if excessively tilled, and to form a plowpan unless the depth of tillage is varied. Water erosion is a slight to moderate hazard. *Capability unit IIe-1; Loamy Prairie range site.*

Lincoln Series

The Lincoln series consists of youthful, calcareous soils that have a shallow surface layer underlain by clean fine sand. These soils vary both in color and in texture. They occur on level and billowy flood plains that are occasionally to frequently overflowed. The depth to the water table depends on the flow of the streams.

The surface layer is calcareous throughout. The uppermost 3 to 6 inches generally is granular, dark-brown clay loam. The lower part, extending to a depth of 8 to 12 inches, is light-colored, stratified, loose fine sand and loamy sand.

The underlying material, extending to a depth of several feet, is very pale brown, loose, structureless fine sand. It has about the same characteristics as that of recent sediments in the stream beds. There is no horizonation in this material.

These soils are more sandy, less stable, and less mottled than Alluvial land. They are more sandy and less coherent than Yahola soils.

In Dewey County, Lincoln soils occur along the North Canadian and South Canadian Rivers and their tributaries. Water penetrates these soils so rapidly that little moisture is stored for the growth of plants. The natural vegetation consists of tall grasses mixed with annual plants, scattered cottonwoods, and sandplum and other brush. Most of the acreage is in pasture.

Lincoln soils (Ln).—These soils occur on level to billowy flood plains of the North Canadian and South Canadian Rivers and their tributaries. The soils that are along the rivers are typical of the series. Those along tributaries have a more silty surface layer and are redder.

These soils are best suited to pasture. Wind erosion and droughtiness are the principal problems and are especially serious during dry summers. The overwash from floods is also harmful to plants. *Capability unit Vw-2; Sandy Bottom Land range site.*

Lofton Series

The Lofton series consists of deep, dark-colored soils that have a compact, clayey subsoil. These soils are in concave areas on high, upland flats. The original cover was mid and tall grasses.

The surface layer is about 8 inches of very dark gray to dark-brown, granular clay loam. It is hard when dry, and if plowed when dry it forms extremely large clods. It is firm when moist but runs together when wet. The surface crusts readily after rains.

The subsoil, which extends to a depth of about 30 inches, is dark gray or very dark gray clay that is massive to blocky. It is extremely hard when dry and is very firm when moist. It is very slow in permeability. It is often saturated for a month or more at a time.

The parent material consists of very old, calcareous, water-laid deposits. In some places, lime has accumulated in the upper part.

These soils are more gray and more clayey than St. Paul soils. Their surface layer is thinner and more clayey than that of Farnum soils. Their subsoil is less sandy than that of the Holdrege and Miles soils.

There is only one Lofton soil mapped in Dewey County. In areas where this soil borders more sandy uplands, the surface layer is more sandy than that described.

Lofton clay loam (Lo).—This soil occurs in slight depressions on the uplands. There is little or no erosion hazard, but excessive tillage will cause the surface to crust after hard rains. Crops are sometimes damaged either by drought or by drowning. Where practical, simple drainage structures should be constructed. Wheat and sorghum are the principal crops. In favorable years, yields of most crops are high. *Capability unit IIIw-1; Hard Land range site.*

Miles Series

The Miles series is made up of deep, level to strongly sloping, moderately sandy soils that have a well-developed subsoil of reddish sandy clay loam. These soils occur on high, wind-worked, sandy uplands. The native cover consists mostly of tall and mid grasses and some scattered shinnery oak and sand sagebrush.

The surface layer is about 10 inches of brown or dark-brown, weak granular to structureless fine sandy loam that is winnowed in many places. It is slightly hard when dry and friable when moist.

The subsoil, which extends to a depth of 40 inches or more, is noncalcareous, prismatic sandy clay loam that is more sandy with depth. In color it ranges from reddish brown in the upper part to reddish yellow or yellowish red in the lower part. Fibrous roots occur in this layer.

The parent material is reddish-yellow or yellowish-red, weakly stratified sandy loam that is more sandy with depth. The reaction is neutral to weakly calcareous. In places there is considerable gravel, but in others there is none.

These soils have a shallower and less sandy surface layer than Nobscot soils and Pratt soils, heavy subsoil variant. Their subsoil is more red and more clayey than that of Pratt soils; more sandy and more red than that of Farnum soils; and less mottled and less clayey than that of the poorly drained Carwile soils. Miles soils have a browner surface layer and a more clayey subsoil than Dill soils.

Miles soils are among the more productive moderately sandy soils in the county. They absorb water readily and have a good capacity to hold water that plants can use. When rainfall is plentiful, summer crops grow well. Sorghum is the principal crop, but small grain and cotton are also grown extensively. Tall native grasses grow exceptionally well on range that is well managed.

These soils are readily pulverized if excessively tilled when dry. They are susceptible to both wind and water erosion. Wind erosion is a severe hazard if the surface soil is pulverized or left bare. A plowpan may form unless the depth of tillage is varied.

Miles fine sandy loam, 0 to 1 percent slopes (MfA).—This soil occurs on the level uplands west of Vici. The surface layer, which is about 17 inches thick, is dark grayish brown. In places, the subsoil is light clay loam. Inclusions of Carwile soils occur in a few depressions. Wheat is the principal crop.

The hazard of wind erosion is slight to moderate. After heavy rains, the surface layer may crust and depressions will remain ponded for a few days. *Capability unit IIe–2; Sandy Prairie range site.*

Miles fine sandy loam, 1 to 3 percent slopes (MfB).—This soil occurs on gently sloping, convex sandy uplands. The surface layer is about 12 inches thick. In some areas the subsoil is brown in color, and in places its texture is heavy sandy loam. Sorghum is the principal crop, but considerable cotton and small grain are grown.

Wind erosion is a moderate hazard. Water erosion is a problem in the more uneven areas. Excessive tillage will destroy the soil structure. In some areas, fertilization and the construction of terraces have helped to increase crop yields. *Capability unit IIIe–4; Sandy Prairie range site.*

Miles fine sandy loam, 1 to 3 percent slopes, eroded (MfB2).—This soil occurs in small, irregularly shaped, eroded areas on gently sloping, convex sandy uplands. Part of the original surface soil has been removed by erosion, and the present surface layer is a mixture of surface soil and subsoil. In shallow gullies and on low knolls, the subsoil is exposed. The surface crusts readily after rains.

This soil is best suited to grass, but small grain and sorghum can be grown. Some fields have been reseeded to native grasses. Sweetclover grows well except during extremely dry years. In cultivated areas, the erosion hazard is severe. *Capability unit IIIe-2; Sandy Prairie range site.*

Miles fine sandy loam, 3 to 5 percent slopes (MfC).—This soil occurs on sloping, convex sandy uplands. The surface layer is about 10 inches thick. In places the subsoil is brown in color, and in some places the texture is heavy sandy loam. Sorghum and small grain are the principal crops. Clover grows wild in some areas.

This soil is moderately susceptible to both wind and water erosion, but it responds readily to proper tillage and other good management. Excessive tillage destroys soil structure and increases the erosion hazard. The use of fertilizers and the construction of terraces have helped to conserve these soils in some areas. *Capability unit IIIe–2; Sandy Prairie range site.*

Miles fine sandy loam, 3 to 5 percent slopes, eroded (MfC2).—This soil occurs on eroded, sloping, convex sandy uplands. Generally, the areas are small and are irregularly shaped. Part of the original surface layer has been removed by erosion, and the present surface layer is a mixture of the surface soil and subsoil. The subsoil commonly is exposed in shallow gullies and on low knobs. In some places, soil material has drifted from eroded areas and formed dunes.

Surface runoff is high on this soil, and erosion is a serious hazard if the soil is cultivated. The surface crusts readily after rains.

This soil is best suited to grass, but small grain and sown sorghum can be grown. Clover grows well in years of adequate rainfall. Native grasses have been reseeded in some abandoned fields. *Capability unit IVe–2; Sandy Prairie range site.*

Miles fine sandy loam, 5 to 8 percent slopes (MfD).—This soil occurs as long, narrow bands on strongly sloping, convex sandy ridges on the uplands. The surface layer is about 8 inches thick. The parent material contains some gravel and generally is calcareous. Sown sorghum, rye, and clover are the principal cultivated crops.

If cultivated, this soil must be carefully managed because it is susceptible to severe water erosion and to moderate wind erosion. Its best use is range. Tall native grasses grow well. *Capability unit IVe–2; Sandy Prairie range site.*

Miles fine sandy loam, 5 to 8 percent slopes, eroded (MfD2).—This soil occurs as narrow bands on strongly sloping, convex uplands. Generally, the areas are small. Part of the original surface layer has been removed by erosion, and the present surface layer is a mixture of surface soil and subsoil or is mostly subsoil material. In shallow gullies, the subsoil is exposed.

This soil is best suited to grass, but small grain and sorghum can be grown. Some areas have been reseeded to native grasses. Others have reverted naturally to grass after cultivation was discontinued. In years of favorable rainfall, clover grows wild in many of these areas.

Runoff is high on this soil, and erosion is a serious hazard if the soil is cultivated. The surface crusts readily after rains. *Capability unit IVe–2; Sandy Prairie range site.*

Nobscot Series

The Nobscot series is made up of well-developed sandy soils that have a banded subsoil of loamy sand. These soils occur on broad, forested uplands. The native cover consists mostly of shinnery oak and post oak. Native grasses grow in a few open areas.

The surface layer is about 28 inches thick. The upper 5 inches is grayish-brown fine sand that is fine granular or structureless (single grain). The lower part is structureless, very pale brown fine sand.

The subsoil is reddish-yellow loamy sand that is structureless but coherent. It contains bands that are yellowish red in color and that range from loamy sand to sandy clay loam in texture and from 1/8 inch to 8 inches in thickness. The bands become irregular, discontinuous, and thinner with depth.

The parent material consists of old, wind-deposited or water-deposited sandy material that generally is structureless and incoherent. This material ranges from sandy loam to fine sand but in places is stratified with clay loam. Normally, it is yellowish red. Its reaction is acid.

These soils commonly are associated with Pratt soils, heavy subsoil variant. They normally have a more sandy surface layer and a less well-developed subsoil than Pratt soils, heavy subsoil variant. Their surface layer is more sandy than that of Miles and Pratt soils.

In Dewey County, Nobscot soils occur in the vicinity of Webb and Oakwood. These soils absorb water readily but are loose, sandy, and low in natural fertility. Consequently, they are mainly idle or are used for pasture. Only the more nearly level areas are cultivated. Rye, sorghum, and cotton are the chief crops. Yields are low

but can be improved by the use of fertilizers and by other good management practices.

Wind erosion is a hazard if Nobscot soils are cultivated. Some areas that were cultivated have been severely eroded by both wind and water, and many fields have been abandoned and are now in native grasses. In some areas, the soil is lighter colored than typical because the surface layer has been mixed with the lighter colored subsoil in tillage.

Nobscot fine sand, rolling (NoE).—Most of this soil is duned, but a few areas are hummocky. The surface layer is about 32 inches thick. Thick woody vegetation, principally shinnery oak, covers much of the acreage. Large areas of this soil are in the vicinity of Oakwood. Small areas of less sloping but hummocky Nobscot soils are included.

Little of the acreage is cultivated. Many fields formerly cultivated have been reseeded to grass or are reverting naturally to native grasses. Many pastures have been improved by removing or spraying the shinnery oak. In these areas, the production of grass is high. *Capability unit VIe–3; Deep Sand Savannah range site.*

Nobscot-Pratt complex, hummocky (NpC).—These soils occur on uneven, sloping, forested, sandy uplands, largely in the vicinity of Oakwood and Webb.

Nobscot soil, which is in the higher areas, makes up about 25 percent of this mapping unit. Pratt soil, heavy subsoil variant, which is in the lower concave areas, makes up about 20 percent. The rest of this mapping unit is an intergrade between these two soils. Typically, the intergrade is on colluvial side slopes or in long, low, hummocky areas. The surface layer, which is about 17 inches thick, is mixed. The uppermost 4 to 6 inches is a loamy fine sand.

About half of the acreage is in forest. The cover consists of post oak, shinnery oak, and some tall native grasses. Most cleared areas are cultivated. The best suited crops are sown sorghum and rye. Low fertility and the hazard of severe wind erosion are the principal management problems. Sand drifts are common along fence rows and roads. These soils respond to additions of fertilizer and to other good management practices. *Capability unit IVe–3; Deep Sand Savannah range site.*

Port Series

The Port series consists of deep, well-drained, medium-textured, level soils that have a dark-brown or reddish-brown, noncalcareous surface layer. These soils occur on fertile bottom lands but are seldom overflowed.

The surface layer, which is 10 to 15 inches thick, is dark-brown or reddish-brown, noncalcareous, friable heavy silt loam that has medium granular structure. Worm casts are numerous and pronounced in this layer.

The subsoil, which extends to a depth of 30 to 40 inches, generally is reddish-brown, calcareous, firm, stratified heavy silt loam that has medium granular structure. It absorbs water readily and has good capacity to store moisture that plants can use. Plant roots have freely penetrated this layer, and worm casts are numerous.

The substratum is reddish-brown, calcareous, stratified light clay loam that has fine, granular structure and is firm when moist. This material consists of water-deposited sediments from the local red beds. Old buried soils commonly occur in this layer.

Port soils have a less clayey surface layer and a more clayey substratum than Spur soils, and they are less sandy than Yahola soils. They differ from both the Spur and Yahola soils in having a noncalcareous surface layer.

There is only one Port soil mapped in the county. It is in the southwestern part and is extensive along West Barnitz Creek and other tributaries of the Washita River. Because of its high fertility, moderate permeability, and ease of management, this soil is well suited to cultivation. Both soil structure and tilth are good. Seedbeds are easily prepared, but the surface may crust after heavy rains. A plowpan is uncommon but may form unless tillage is varied. All crops and grasses generally grown in the area are suitable. Yields are high.

Port silt loam (Po).—This soil occurs on level bottom lands that are seldom overflowed. In most areas the surface layer is silt loam, but in a few areas it is more sandy and is calcareous.

Most of the acreage is cultivated. Only small, isolated areas are used for pasture. Wheat, alfalfa, and cotton are the principal crops. Yields of both crops and forage plants are consistently high. *Capability unit I–1; Loamy Bottom Land range site.*

Pratt Series

The Pratt series is made up of deep, coarse textured and moderately coarse textured soils that have a weakly developed subsoil. These soils are on the uplands and consist of sandy mantles that have been deposited or reworked by wind. The topography ranges from concave areas along drainageways to long, high, sharp dunes. The original cover consisted mostly of tall native grasses and some sand sagebrush.

Two types of Pratt soils were mapped in Dewey County. In one, the surface layer is 10 to 15 inches of brown or dark grayish-brown, granular fine sandy loam, and the subsoil is brown sandy loam with prismatic structure that breaks to granular. At a depth of 28 to 33 inches, the subsoil is lighter colored and more sandy. At a depth of 42 inches, it is underlain by reddish-yellow loamy fine sand.

In the other type, the surface layer is about 12 inches of brown loamy fine sand that is slightly hard when dry, and the subsoil is brown loamy fine sand with weak prismatic structure. At a depth of 30 inches or more, the subsoil is underlain by pale-brown loamy fine sand that is loose and structureless.

Pratt soils are more acid and slightly better developed than Enterprise soils. They are less red than the associated Miles soils, and they have a less clayey subsoil. They are less sandy and better developed than Tivoli soils. Pratt soils, heavy subsoil variant, have a more clayey and better developed subsoil than the other Pratt soils.

Broad areas of Pratt soils occur in the northwestern part of the county, in the vicinity of Vici. In the eastern part of the county, Pratt soils may be slightly more red than the typical soil described. In areas that have been cultivated, the surface layer is lighter colored and is commonly winnowed. Where the parent material consists of water-laid deposits, there may be some scattered gravel or knobs of gravel.

Pratt soils have moderately rapid to rapid permeability, are friable to very friable, and are slightly acid. Wind erosion is a moderate to severe hazard. Considerable acreage has been left in grass or has been reseeded to native grasses. If intensive measures are taken to control wind erosion, these soils are moderately productive. Rye, sudan, and sorghum are the principal crops.

Pratt fine sandy loam, 1 to 3 percent slopes (Ps).—This soil is along drainageways that parallel dunes, or it is adjacent to dunes in slight depressions that have no outlets. Inclusions of Carwile soils occur in the lowest spots and make up as much as 10 percent of the mapping unit. Small grain and sorghum are the principal crops, but alfalfa and cotton are also well suited.

Wind erosion is a moderate hazard. Runoff from higher areas is a problem during hard rains. The surface soil tends to dry out quickly if excessively tilled. A plowpan will form unless the depth of tillage is varied. *Capability unit IIIe-4; Sandy Prairie range site.*

Pratt loamy fine sand, undulating (PpB).—This soil occurs on broad uplands. It is characterized by mounds as much as 8 feet high. Inclusions of Pratt fine sandy loam and of Carwile soils occur in depressions and make up as much as 10 percent of the mapping unit. Rye, vetch, cowpeas, sudan, and millet are grown for temporary pasture and are the best suited crops. Sorghum, alfalfa, and other small grain can be grown if rainfall is favorable. The response to additions of fertilizer has been good.

Wind erosion is a severe hazard but can be controlled to some extent by stubble-mulch tillage. The choice of crops is limited, however, because of this hazard and because of the low capacity of the soil to store moisture that plants can use. *Capability unit IIIe-3; Deep Sand range site.*

Pratt loamy fine sand, hummocky (PpC).—This soil is characterized mostly by hummocks that are 6 to 18 feet high and that have slopes of 3 to 8 percent. Pratt fine sandy loam and Carwile soils occur in the depressions between the hummocks and make up about 10 percent of this mapping unit.

This soil is best suited to range. It will support a dense cover of tall native grasses, but sand sagebrush will become a pest in pastures that are overgrazed. Rye and vetch are often grown for temporary pasture. Continuous row crops are not suitable.

Intensive measures are needed in cultivated areas to control severe wind erosion. Uneven water distribution is also a problem. *Capability unit IVe-3; Deep Sand range site.*

Pratt-Tivoli loamy fine sands (Pt).—These soils occur in sandy areas that consist mainly of low choppy dunes and high dunes. The dunes range from 15 to 40 feet in height and have slopes of more than 7 percent. Tivoli soils make up from 15 to 25 percent of this mapping unit. They are somewhat more sandy than the Pratt soils and are less well developed. They occur mainly on the ridge tops of dunes. Tivoli soils are described in more detail under the heading "Tivoli Series."

Little of this acreage is cultivated. Tall and mid grasses are dominant in the vegetation, but sand sagebrush also occurs in moderate amounts. It becomes dominant in pastures that are overgrazed. *Capability unit VIe-1; Deep Sand range site.*

Pratt Series, Heavy Subsoil Variant

Pratt series, heavy subsoil variant, consists of deep, well-developed sandy soils that have a subsoil of yellowish-brown sandy clay loam. These soils occur on the uplands, both in areas that were originally wooded and on savannas. The cover consists principally of post oak and shinnery oak. Openings between trees are covered with native grasses (fig. 13).

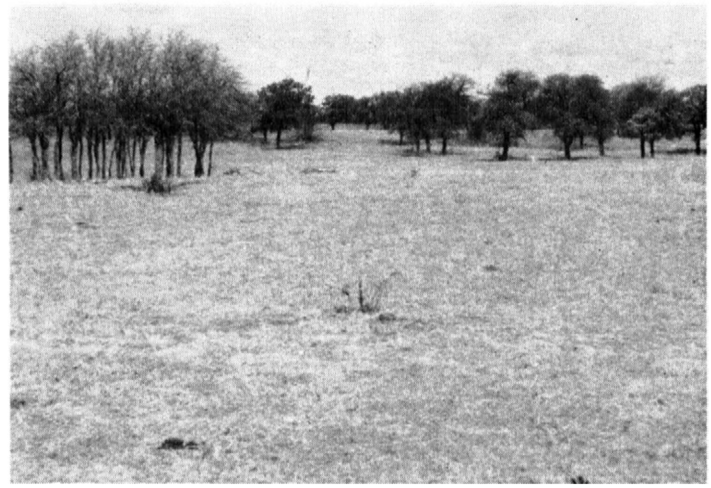

***Figure 13.*—Typical landscape and cover on Pratt loamy fine sand, heavy subsoil variant, undulating. There is much less shinnery oak on this soil than on associated Nobscot soils.**

The surface layer is about 22 inches thick. The upper part is brown or grayish-brown, granular loamy fine sand. The lower part is pale-brown, structureless fine sand.

The subsoil is about 34 inches of yellowish-brown sandy clay loam that has coarse, prismatic structure and is very hard when dry. The lower part grades to fine sandy loam. The subsoil is moderately permeable and has a high capacity to store water that plants can use.

The parent material consists of old, sandy, wind-deposited or water-deposited material that typically is structureless and incoherent. The texture ranges from sandy loam to fine sand, but in places there are stratified layers of clay loam. The color normally is reddish yellow. The reaction is neutral to acid.

Soils of the Pratt series, heavy subsoil variant, are associated with Nobscot soils. They generally have a less sandy surface layer than Nobscot soils and a better developed, less sandy subsoil. They have a more sandy surface layer than Miles soils, and they are more clayey and better developed than other Pratt soils.

Most of the acreage is cultivated. Small grain, cotton, and sorghum are widely grown, but rye is the principal crop. The use of fertilizers on these soils not only increases yields but hastens the initial growth of plants to provide more and earlier winter pasture.

Pratt loamy fine sand, heavy subsoil variant, undulating (PrB).—This soil occurs on gently sloping uplands that were originally wooded. The surface is fairly smooth. In many places the surface layer is winnowed.

Cultivation tends to lower the fertility of this soil, to deplete the content of organic matter, and to increase the

erosion hazard. Leaving all crop residues on the surface will help to control erosion and to add organic matter. *Capability unit IIIe-3; Deep Sand Savannah range site.*

Quinlan Series

The Quinlan series is made up of calcareous, reddish, shallow, loamy soils on the uplands. The parent material was sandstone and sandy shale. The original cover consisted mostly of mid grasses.

The surface layer is about 11 inches of reddish-brown or yellowish-red, granular loam that is friable when moist. It commonly is calcareous.

The underlying material generally is red or light-red, calcareous, weakly cemented sandstone. It ranges from soft to extremely hard. In many places, lime has accumulated along natural cracks.

Quinlan soils are associated with Woodward, Carey, and St. Paul soils, but they are less deep, less dark colored, and less well developed than those soils.

Quinlan soils are extensive in the county, particularly in the sloping to very steeply sloping red-bed areas in the central and western parts. Most of the acreage is in pasture. Mid grasses are the principal forage plants. Soils that have a slope of less than 5 percent are generally cultivated. The principal management problems are low moisture-holding capacity, susceptibility to water erosion, tendency of the surface to crust, and shallowness of the root zone. Sorghum, small grain, sudan, and sweetclover are the most widely grown crops. Normally, yields are low.

Quinlan loam (Qm).—This soil is mainly on the very steep side slopes of drains. It occurs throughout the red-bed areas. About 15 percent of the mapping unit is bare sandstone walls. A small part is recent alluvium that has accumulated along the sides of drains. The rest is Quinlan fine sandy loam to heavy loam.

All of the acreage is used for pasture. Even if the soil is well managed, water erosion is a severe hazard on the steeper slopes. The cover consists principally of mixed native grasses and some scattered groves of cedar trees. *Capability unit VIe-4; Shallow Prairie range site.*

Quinlan soils, severely eroded (Qn3).—These soils occur in small, sloping to steeply sloping, red-bed areas. All of the acreage has been cultivated at some time. Now, most of the original surface layer has been removed by erosion, and gullies have cut into the parent rock. Consequently, these soils are no longer suitable for crops. Included are a few badly gullied areas of Woodward, Carey, and St. Paul soils.

These soils may be difficult to manage because of high runoff and continued erosion. In many places, however, runoff from higher areas can be diverted. Most areas need to be reseeded to establish a vegetative cover. Suitable grasses are buffalograss, grama grasses, dropseed, and little bluestem. *Capability unit VIe-6; Eroded Prairie range site.*

Quinlan-Enterprise complex (Qp).—The soils in this complex occur where the sandy uplands and the red beds meet. They are extensive along the South Canadian River. Here, the red beds are covered by a thin, moderately sandy mantle. In places there is a thin layer of gravel on the surface.

Modal Quinlan soils make up from 20 to 50 percent of this complex and are along draws and on knobs and ridges. Modal Enterprise soils make up from 20 to 40 percent, and nonmodal Enterprise soils, at least 10 percent but commonly about 30 percent. These soils are mostly on side slopes. The nonmodal Enterprise soils are reddish-brown fine sandy loam to a depth of about 30 inches. They are noncalcareous in reaction. Commonly, gravel is scattered throughout the surface layer. Enterprise soils are described in more detail under the heading "Enterprise Series."

All of the acreage is in permanent pasture. If pastures are well managed, the production of forage is high. The grass vegetation is often spotty because the deep, sandy soils supply sufficient moisture for grasses, and the shallow soils and the many gravelly knobs are droughty. The cover consists mostly of mixed grasses, but tall and mid grasses are dominant. Some sand sagebrush is scattered throughout the cover. Sand sagebrush will become dominant if pastures are overgrazed. *Capability unit VIe-5; Shallow Prairie and Sandy Prairie range sites.*

Quinlan-Woodward loams, 3 to 5 percent slopes, eroded (QwC2).—These soils occur on the uplands, among deeper red-bed soils. A large acreage is between Lenora and Camargo. Most of the organic matter has been removed from these soils by erosion, and the surface tends to crust after rains. The combined thickness of the surface layer and the underlying layer averages only about 13 inches. In some fields, shallow gullies are common.

These soils are so mixed that it was not practical to map them separately. Quinlan soils make up about 70 percent of the mapping unit and occur on side slopes and in narrow valleys. They are more shallow and lighter colored than typical Quinlan soils. Woodward soils make up the rest of the mapping unit and are on hills or ridges. They are lighter colored than typical Woodward soils, and their surface layer is more loose. The combined thickness of their surface layer and subsoil is about 20 inches. Woodward soils are described in detail under the heading "Woodward Series."

High-quality forage is produced on the soils that are used for range. Yields of small grain and sorghum are fair on cultivated soils that are well managed. If these soils are to remain in cultivation, water erosion must be controlled. *Capability unit IVe-1; Shallow Prairie and Loamy Prairie range sites.*

Quinlan-Woodward loams, 5 to 20 percent slopes (QwE).—These soils occur in red-bed areas on the uplands. Shallow Quinlan soils make up about 50 to 85 percent of this mapping unit and occur in the steeper areas and on ridge tops. Woodward soils make up the rest of the mapping unit and occur on side slopes or in swales. Woodward soils are described in detail under the heading "Woodward Series."

These soils are either too steep or too shallow to be suited to cultivation. All of the acreage is now used for pasture. A good grass cover will help to conserve moisture, reduce runoff, and increase the infiltration of water. If grazing is controlled, the dominant vegetation is little bluestem, side-oats grama, blue grama, and buffalograss. *Capability unit VIe-7; Shallow Prairie and Loamy Prairie range sites.*

Rough Broken Land

Rough broken land (Rb).—This land type occurs mainly as narrow, rough canyons in red-bed areas on the uplands. These canyons have formed in various materials but mostly in sandstone. In some places, they have nearly vertical walls of unweathered, exposed sandstone. A typical canyon is about 55 feet deep, 150 yards wide, and more than a half mile long. One large area of Rough broken land is on the north side of the South Canadian River, north of Taloga.

Associated with this land type are Woodward and Quinlan soils, which occur on the less steep side slopes. An unstable band of recent alluvium occurs on the narrow bottom lands along drains.

Rough broken land is suited only to controlled grazing. A protective mulch that will help to retain runoff may become established if grazing is controlled. In places, the canyons limit access to adjacent rangeland.

The vegetation consists mostly of side-oats grama, dropseed, sand bluestem, little bluestem, some cedar, and a few cottonwoods. The taller grasses generally grow on the recent alluvium. The shorter grasses grow on the more shallow soils. *Capability unit VIIe-1; Breaks range site.*

St. Paul Series

The St. Paul series consists of deep, dark-colored silty soils that have a fairly compact, well-developed, dark-reddish subsoil of silty clay loam or clay loam. The native cover consists mostly of mid grasses.

The surface layer is about 16 inches of friable, dark-brown silt loam. It is granular and porous and absorbs water readily.

The subsoil is about 36 inches of dark-reddish or brownish silty clay loam or clay loam that has blocky to subangular blocky structure and is friable to very firm when moist. It is moderately slow in permeability but is easily penetrated by roots. The lower part is high in water-holding capacity and generally is calcareous.

The parent material is weathered, calcareous red-bed sandstone or shale. It is predominantly yellowish red in color, but in many places, because of the influence of old buried soils, it is grayish brown. In some places, lime has accumulated in the upper part.

St. Paul soils occur in red-bed areas on level to sloping uplands. They are important agricultural soils. Most of the acreage is cultivated. Wheat is the principal crop, but most crops commonly grown in the county are suitable. Yields are consistently good. A plowpan is likely to form if these soils are tilled when too wet or if they are tilled continuously at the same depth. Excessive tillage will pulverize the surface soil and cause it to crust after rains. Water erosion is a hazard on the stronger slopes.

St. Paul silt loam, 0 to 1 percent slopes (SaA).—This soil occurs in level areas and in depressions. The surface layer is about 18 inches thick. The upper part of the subsoil is friable; the lower part is blocky and is extremely firm when moist. In depressions, the soil is darker colored than is typical, and it may remain ponded for short periods after rains. Included are some soils that have a surface layer of clay loam.

Runoff from higher areas is often a problem on this soil. Practices to conserve moisture will help to maintain high yields. *Capability unit IIc-1; Hard Land range site.*

St. Paul silt loam, 1 to 3 percent slopes (SaB).—This soil occurs on gently sloping uplands throughout the county. More than 40,000 acres have been mapped. The surface layer, which is about 15 inches thick, is underlain by a fairly compact, firm subsoil. The subsoil generally is reddish brown or dark reddish brown in color but becomes more red with depth. Inclusions of Carey soils occur on some low convex knobs. Wheat and sorghum are the principal crops.

This soil is slightly susceptible to water erosion. If excessively tilled, the surface layer crusts readily after rains. *Capability unit IIe-1; Hard Land range site.*

St. Paul silt loam, 3 to 5 percent slopes (SaC).—This soil occurs on convex uplands throughout the central part of the county, commonly on easterly and northerly slopes. The surface layer is about 12 inches thick and in places is light clay loam.

This is one of the most productive sloping soils in the county, but the choice of crops is limited because of prevailing climatic conditions and the hazard of water erosion. Small grain and sorghum are suitable, and in most years sweetclover grows well. Native grasses provide a dense cover. *Capability unit IIIe-1; Hard Land range site.*

St. Paul clay loam, 3 to 5 percent slopes, eroded (ScC2).—This soil occurs as small areas on convex uplands. It commonly is on the breaks of slopes or at the head of drains. Much of the original surface layer has been removed by erosion. The present surface layer is either a mixture of the surface layer and the subsoil, or it is mostly subsoil material. Where the subsoil is exposed in shallow gullies, yellow and gray are mixed with the darker colors of the original surface layer, and the surface appears spotted.

This soil is best suited to grass. Some fields have been reseeded to native grasses, and others that have been abandoned have reverted naturally to grass or clover. Small grain and sown sorghum can be grown. In cultivated areas, runoff is high and the erosion hazard is severe. *Capability unit IVe-1; Hard Land range site.*

Spur Series

The Spur series consists of deep, dark-colored soils that are calcareous throughout and, in many places, are slightly saline. These soils occur on bottom lands that are seldom overflowed by the rivers but that are occasionally flooded by overflow from the side drains. The moderately shallow depth to the water table is favorable for the growth of cultivated crops.

The surface layer is about 18 inches of brown, granular clay loam.

The subsoil, which extends to a depth of about 36 inches, consists of reddish-brown, granular clay loam that is friable when moist. It is moderately permeable and is easily penetrated by roots. Salt crystals may be scattered throughout the lower part.

The substratum is reddish-yellow, stratified loamy fine sand that has faint, rust-colored mottles. It is structureless, and when moist it is very friable. Salt crystals make up about 5 percent of this material.

Spur soils have a less clayey substratum than Port soils, and they have a calcareous surface layer. They are less sandy than Yahola soils, and generally their surface layer is less red.

Only one Spur soil is mapped in Dewey County. This soil occurs along the North Canadian and South Canadian Rivers. It is used mostly for growing wheat, alfalfa, and cotton, but it is suited to most crops commonly grown in the county. Only a small acreage is in pasture. Yields of both crops and forage are high.

If well managed, this soil is easy to maintain. It is easy to till, but if tilled when too moist it puddles and, in drying, forms clods that are difficult to work into satisfactory seedbeds. The crusting of the surface layer after hard rains may necessitate some reseeding.

Spur clay loam, deep water table (Sp).—This soil occurs on the level flood plains of the North Canadian and South Canadian Rivers. It absorbs water at a moderate rate, and its capacity to store moisture that plants can use is good. There is little or no hazard of erosion.

To preserve soil structure, excessive tillage should be avoided and the depth of tillage should be varied. *Capability unit I–1; Subirrigated range site.*

Tipton Series

The Tipton series consists of deep, dark-colored, well-drained soils that consist of wind-deposited or water-deposited material. These soils occur on low terraces along rivers. The water table is within 15 feet of the surface.

The surface layer is about 20 inches of dark-brown to very dark grayish-brown, granular silt loam that is neutral in reaction.

The subsoil, which extends to a depth of about 51 inches, consists of brown to dark-brown, prismatic clay loam or silty clay loam. It absorbs water readily and has a good capacity for storing moisture and plant nutrients. The subsoil is neutral or calcareous. Plant roots are abundant throughout this layer.

The substratum consists mostly of old, calcareous, stratified, water-deposited sediments but includes some material that was deposited by wind. Generally, this material is loamy in texture and brown in color. Many roots extend deep into this layer and obtain moisture from the water table.

There is only one Tipton soil mapped in Dewey County. It occurs on low terraces along the North Canadian and South Canadian Rivers. Most of the acreage is cultivated.

Tipton silt loam, 0 to 1 percent slopes (TpA).—This soil occurs as wide, level bands just above the flood plain. The water table, which is within 15 feet of the surface, furnishes moisture to deep-rooted plants.

Normally, this soil is high in content of organic matter, but if pulverized by excessive tillage, it will crust readily after rains. It is not susceptible or is only slightly susceptible to erosion. At times, runoff from higher areas is a problem. A plowpan is likely to form unless the depth of tillage is varied.

Most of the acreage is cultivated. This soil is well suited to alfalfa and to most crops commonly grown in the county. The production of forage is high on the small acreage used for range. *Capability unit I–1; Loamy Prairie range site.*

Tivoli Series

The Tivoli series is made up of deep, light-colored sandy soils that occur in areas of wind-drifted sand dunes. These dunes extend in a southwesterly-northeasterly direction and are commonly on the north side of rivers. The native cover consists of tall and coarse grasses, sand sagebrush, wild plum, skunkbush, and post oak. The cover has helped to stabilize most of the dunes. Where the cover is thin, blowouts are common.

The surface layer is about 10 inches of loose fine sand that is porous and very rapidly permeable. The reaction is neutral. A slight accumulation of organic matter has darkened the upper part.

The underlying material is reddish-yellow, loose fine sand that is uniform to a depth of many feet. It is low in content of organic matter and plant nutrients. Roots and water penetrate this layer readily. The reaction is neutral to mildly alkaline.

Tivoli soils have a more sandy subsoil than Pratt and Nobscot soils. In Enterprise soils, the subsoil is more silty.

There is only one Tivoli soil mapped in Dewey County. This soil is too steep or too sandy for cultivation. All of the acreage is either in pasture or is idle. Overgrazing will destroy the vegetative cover and subject the soil to blowing. Consequently, a good pasture management program is essential.

Tivoli fine sand (Tv).—This soil is in duned areas along the rivers. Large areas occur north of the Canton Reservoir and in the vicinity of Nobscot. The surface layer, which is from 8 to 12 inches thick, consists of loose fine sand that is very rapidly permeable.

Most of the acreage is well covered with grasses and brush, but in places there are small active blowouts. Unless this soil is protected from overgrazing, the cover will become thin and the soil will be shifted by the wind. *Capability unit VIIe–2; Dune and Deep Sand range sites.*

Vernon Series

Soils of the Vernon series are youthful, shallow, reddish brown, and clayey. They occur in sloping to very steeply sloping, dissected red-bed areas. The cover is principally short native grasses.

The surface layer is about 10 inches of reddish-brown, calcareous, granular clay loam that is friable when moist. It supplies most of the water and nutrients for plant growth. Roots are numerous. This layer is underlain abruptly by the parent material.

The parent material is red or reddish-brown, calcareous, consolidated claystone. Except for the uppermost few inches, which is weathered, this material is not permeable to roots or water.

Vernon soils are more clayey than Quinlan soils. They occur in the southwestern part of Dewey County, west and north of Leedey. Less than 2,000 acres have been mapped, and most of the acreage is used for range. The few areas that have been farmed are now mostly in grass. Even with good management, yields of forage are only fair.

Vernon soils, severely eroded (Vs3).—These soils occur primarily in sloping to strongly sloping areas around deeper cultivated soils. They have been damaged by both sheet and gully erosion, but sheet erosion is the more evi-

dent. In places, there are outcrops of claystone. Only about half the acreage has a vegetative cover.

These soils are not suitable for crops. Preventing further erosion by diverting excess runoff to suitable outlets is the most important management requirement. Restricting grazing and reseeding many areas will also help to improve these soils. *Capability unit VIe-6; Eroded Prairie range site.*

Vernon complex (Vx).—These soils occur in strongly sloping to very steeply sloping areas that are dissected by raw, rough, broken drains. Typical Vernon soils occur on the rolling hills or flattened knobs and make up from 60 to 80 percent of the mapping unit. Soils that are deeper than typical occur on the narrow side slopes between the knobs and drains and make up from 20 to 35 percent of the mapping unit. Outcrops of claystone make up as much as 20 percent.

This unit is not suited to crops. All of the acreage is used for range. The most suitable native plants are buffalograss, side-oats grama, blue grama, and little bluestem. However, even under good management, yields of forage are low to moderate. *Capability unit VIe-9; Red Clay Prairie and Red Shale range sites.*

Wann Series

The Wann series consists of deep, calcareous, dark-colored, loamy, alluvial soils that occur on nearly level flood plains of large creeks and on fans deposited by streams. The original cover was principally tall native grasses.

The surface layer is about 30 inches of granular, brown loam that is friable and calcareous. In some places, the lower part is stratified and more gray. Below this layer, the material grades to structureless, grayish-brown, calcareous fine sandy loam that is friable, faintly mottled, and stratified. In some places, salt crystals are common.

The substratum, at a depth of about 45 inches, is loose, structureless, stratified, light-brown loamy fine sand that is mottled with dark grayish brown and yellowish brown. The water table generally is at a depth of about 60 inches. Layers of a buried, dark-colored soil are common below a depth of 4 feet. This material was darkened by organic matter at an earlier period when the bottom lands were stable.

Wann soils are less mottled and deeper over sand than Alluvial land. They are less red than Yahola soils, and they are less clayey than Port and Spur soils.

The Wann soils in Dewey County consist of alluvial deposits along local streams that drain the sandy upland mantles. After the uplands were farmed, the deposits increased because of erosion. In places, sand blocked the channels and caused the streams to overflow. Generally, these deposits are loose and sandy. Many trees line the streambanks, and in some places they cover the entire bottom land. Wann soils are used mainly for alfalfa and small grain. Most of the acreage is in protected spots and is well suited to winter pasture.

Wann soils (Wa).—These soils are on nearly level flood plains of local streams. They are well suited to crops, principally wheat and alfalfa. The production of forage is high in the many areas used for meadow or for winter pasture.

Commonly, the hazard of wind erosion is slight, but if the surface layer is pulverized by tillage, soil blowing and surface crusting become more difficult to control. *Capability unit IIw-1; Loamy Bottom Land range site.*

Woodward Series

The Woodward series consists of reddish, moderately deep, loamy soils that formed from weathered sandstone or shale. These soils occur in nearly level to very steeply sloping red-bed areas. The original cover consisted of tall and mid native grasses.

The surface layer is about 16 inches of granular, reddish-brown loam that is friable when moist.

The subsoil is about 18 inches of granular, yellowish-red or reddish-yellow loam that is friable when moist. It is readily penetrated by both plant roots and water. This layer is principally a thick, transitional horizon between the surface layer and the parent material. The lower part becomes more red and commonly contains free lime.

The parent material is calcareous, partly weathered, fine-grained sandstone or sandy shale. Lime has accumulated along many natural cracks.

Woodward soils are associated with Carey, St. Paul, and Quinlan soils. They are less well developed and less clayey than Carey and St. Paul soils. They are deeper and better developed than Quinlan soils, and they are more clayey than Dill soils.

Woodward soils occur throughout most of Dewey County. They are used extensively for both crops and range. The less sloping soils are well suited to sown sorghum, small grain, and sweetclover. The more steeply sloping soils are best suited to tall and mid grasses, which provide high-quality forage.

The hazard of wind erosion is slight to moderate, but the hazard of water erosion is severe. Excessive tillage will pulverize the surface soil and cause it to crust after rains.

Woodward loam, 3 to 5 percent slopes (WbC).—This soil occurs in the red-bed areas on the uplands.

About half of the acreage is cultivated. Sorghum is the principal crop, but small grain and sudan are also widely grown. Yields are not high but are fairly stable from year to year, even in dry periods. Wind erosion is a slight hazard, and water erosion is a moderate hazard. The surface layer is granular but will crust after heavy rains. In areas used for permanent pasture, yields of forage are good. *Capability unit IIIe-1; Loamy Prairie range site.*

Woodward-Carey complex, 1 to 3 percent slopes (WcB).—These soils occur in gently sloping, somewhat clayey, red-bed areas in the southwestern part of the county. Broad, gently sloping areas are in the vicinity of Leedey.

Woodward soils make up from 15 to 25 percent of the mapping unit. They have a darker colored, finer textured surface layer than is typical of the series. Commonly, they are neutral to a depth of 12 inches. The parent material is light-red shale interbedded with sandstone.

Carey soils make up from 10 to 20 percent of this mapping unit. They are more shallow than is typical, are granular throughout, and are calcareous at a depth of about 12 inches. The surface layer is about 14 inches

thick; the subsoil is about 20 inches thick. The parent material is interbedded shale and sandstone. Carey soils are described in detail under the heading "Carey Series."

The rest of this mapping unit consists of a soil that is intermediate between these two series. In some characteristics, it is similar to both series; in others, it is different from both.

The soils of this complex are slightly susceptible to water erosion. If excessively tilled, the surface crusts readily after rains. Much of the acreage is in crops, principally wheat, cotton, barley, and sorghum. Crops often have a spotted appearance because of the low moisture-holding capacity of the more shallow soils. Yields of sweetclover and of mid and tall native grasses are good in areas used for range. *Capability unit IIe-1; Loamy Prairie range site.*

Woodward-Carey complex, 3 to 5 percent slopes, eroded (WcC2).—These soils are in small, eroded areas and are associated with deeper soils in convex, red-bed areas. They occur in such intricate patterns that it was not practical to map them separately. Woodward soils make up about 70 percent of the mapping unit. They are more strongly granular than is typical of the series, and their surface layer is lighter colored and more clayey. Carey soils make up the rest of the mapping unit. They are more shallow, lighter colored, and less fertile than typical Carey soils.

Water erosion has removed much of the original surface layer and most of the organic matter from the soils of this complex. The present surface layer, which is only about 7 inches thick, crusts readily after rains. Runoff is high, and shallow gullies are numerous in some fields.

All of the acreage has been cultivated, but some fields have been reseeded to native grasses. If cultivated, the soils of this complex are susceptible to severe erosion. They are best suited to small grain, sown sorghum, sweetclover, and grass. Productivity can be greatly increased by good management. *Capability unit IVe-1; Loamy Prairie range site.*

Woodward-Carey complex, 5 to 8 percent slopes, eroded (WcD2).—These soils occur in strongly sloping, convex areas in association with deeper soils. They occur in such intricate patterns that it was not practical to map them separately. Woodward soils make up from 60 to 80 percent of the mapping unit. They are more clayey and more strongly granular than is typical of the series, and they have a lighter colored surface layer. Carey soils make up the remaining 20 to 40 percent. They are more shallow, less fertile, and lighter colored than typical Carey soils.

Much of the original surface layer and most of the organic matter has been lost from soils of this complex through erosion. The present surface layer, which is only about 6 inches thick, crusts readily after rains. In some fields shallow gullies are common. Other fields show more evidence of sheet erosion.

All of the acreage has been cultivated at some time, but many fields have been reseeded or have reverted naturally to native grasses. These soils can be cultivated only if intensive conservation practices are used to control erosion. They are best suited to permanent pasture. Small grain, sown sorghum, and sweetclover are the better suited crops. Big bluestem, little bluestem, side-oats grama, and Indiangrass are the most suitable pasture plants. *Capability unit IVe-1; Loamy Prairie range site.*

Woodward-Dill fine sandy loams, 0 to 3 percent slopes (WdB).—These soils occur on nearly level to gently sloping areas between the North Canadian River and the bordering red-bed escarpments. They are moderately deep over reworked or scoured, soft sandstone.

Woodward soils make up about 65 percent of this mapping unit and occur in low convex areas. They have a surface layer of fine sandy loam. In most places, the depth to the calcareous material is about 18 inches. The parent material is sandstone or packsand.

Dill soils make up the remaining 35 percent of the mapping unit and occur in shallow depressed valleys that dissect the Woodward soils. They are typical of the series except that in places they are darker colored to a greater depth. Dill soils are described in detail under the heading "Dill Series."

Most of the acreage is cultivated. Sorghum and wheat are the principal crops, but other small grain, forage sorghum, and sudan are also widely grown. Wind erosion is a severe hazard if the soils are cultivated. *Capability unit IIe-2; Sandy Prairie range site.*

Woodward-Quinlan loams, 3 to 5 percent slopes (WwC).—These soils are in sloping red-bed areas on the uplands. They occur in such intricate patterns that it was not practical to map them separately.

Moderately deep Woodward soils occur on side slopes and in narrow valleys. They make up about 65 percent of the mapping unit. Their surface layer is about 12 inches of dark reddish-brown, granular loam. The subsoil, which extends to a depth of 26 inches, is reddish-brown loam that is transitional to the underlying weathered sandstone.

Shallow Quinlan soils occur on low hills or ridges and make up the remaining 35 percent of the mapping unit. They are fairly typical of the series, except that the surface layer is red and is somewhat deeper than that of the typical Quinlan soils.

Most of the acreage is used for pasture. The production of mid and tall grasses is good. If cultivated, these soils need to be well managed. They are somewhat low in moisture-holding capacity and are too shallow to be good for crops. Organic matter is easily removed, both by cultivation and by erosion. Areas that do not have a vegetative cover are subject to wind and water erosion. *Capability unit IVe-1; Loamy Prairie and Shallow Prairie range sites.*

Yahola Series

The Yahola series consists of young, reddish, calcareous, moderately sandy soils on the flood plains of large streams or on fans or aprons at the mouth of streams that drain the red-bed uplands. These soils are subject to occasional flooding. The cover consists principally of big bluestem, switchgrass, and Indiangrass.

The surface layer is about 20 inches of stratified, reddish-brown fine sandy loam or very fine sandy loam.

The subsoil, which extends to a depth of about 43 inches, is stratified, yellowish-red fine sandy loam that is rapidly permeable and very friable. It is less fertile than the surface layer.

The substratum is more stratified, lighter colored, and sandier than the subsoil.

Yahola soils are more red than Wann soils and less clayey than Spur and Port soils. They are deeper and generally are more red than Lincoln soils.

Yahola soils make up more than 16,000 acres and occupy more than half of the bottom lands in the county. They are easily tilled and are fairly fertile. Excessive tillage will pulverize the soil and make wind erosion more difficult to control. A plowpan is likely to form unless the depth of tillage is varied. Occasionally, crops are damaged by overflow from streams.

Most of the larger areas are used for cultivated crops, and the smaller areas, for pasture. Yields of small grain, sorghum, alfalfa, and cotton are consistently moderate to high. Yields of forage are good.

Yahola fine sandy loam, high (Ya).—This soil occurs on nearly level fans and aprons along the North Canadian and South Canadian Rivers. It consists of sand and silt that have been deposited on high terraces by streams that drain the red-bed areas. This soil slopes consistently in one direction. Consequently, if it is flooded, the water drains off quickly.

Most of the acreage is used for cultivated crops, principally wheat and sorghum. Yields generally are good, but they could be increased. A large amount of forage is produced on the small acreage used for range. Occasionally, runoff from higher areas overflows this soil, but it seldom, if ever, kills crops. Wind erosion is a slight to moderate hazard. *Capability unit IIe-2; Loamy Bottom Land range site.*

Yahola fine sandy loam (Yf).—This soil occurs on nearly level flood plains of local tributaries that drain the red-bed areas. Old, dark-colored, buried soils occur at various depths. They were buried after cultivation of the uplands increased the rate of erosion. The later sediments are more red, more sandy, and less fertile. The degree of stratification in this soil depends on the type of sediments and on its position in relation to the streams. Stream channels meander throughout most of the acreage, and most areas could possibly be destroyed by the shifting of the stream channel. This soil is occasionally overflowed, but it seldom remains ponded, because it is highly porous.

About three-fourths of the acreage is cultivated. Wheat, alfalfa, and forage sorghum are the principal crops. Some long, narrow areas are used for range along with adjoining rangeland. Wind erosion is only a moderate hazard because most of the acreage is fairly well protected by the higher uplands and by trees that line the streambanks. *Capability unit IIw-1; Loamy Bottom Land range site.*

Use and Management of Soils

This section offers suggestions on the use of soils for crops, range, trees, wildlife, and engineering structures, and on the suitability of the soils for irrigation. It includes an explanation of the system of classification used to show the relative suitability of the soils for various uses. Table 6 gives the estimated yields of the principal crops, under prevailing management and under improved management; table 7 shows the suitability of the soils for windbreaks and post lots; and tables 8, 9, and 10, the characteristics of the soils significant in engineering.

Management of the Soils for Cultivated Crops [4]

The successful farmer is conservation minded. He knows how much his soils will produce and the limitations of the different soils on his farm. He applies conservation methods suited to the climate and to the soils so that he can obtain profitable yields.

The main problems of management in Dewey County are (1) protecting the soils from erosion caused by wind and water, (2) preserving tilth necessary for high-level production, and (3) maintaining fertility. Among the practices used to achieve these goals are keeping tillage to a minimum, rotating soil-depleting crops with legumes or other soil-building crops; planting cover crops; returning crop residues to the soils; applying fertilizer; terracing; grassing waterways; and stubble mulching, strip-cropping, and deep plowing.

This section, used with the following one on management by capability units, will aid farmers in selecting the practices appropriate for the soils on their farms.

Conservation cropping.—Conservation cropping involves growing suitable crops to help control erosion, conserve moisture, and maintain or improve productivity, and to help control weeds, insects, and diseases.

Dewey County is in an area of limited rainfall. Consequently, rigid crop rotations generally are not practical. Legumes, valuable both as soil-building crops and as cover crops, are difficult to grow in years of low rainfall. In dry years, high-residue crops other than legumes can be grown in the crop rotation instead of legumes. The residues should be returned to the soil and properly managed.

Wheat can be grown continuously or in a wheat-fallow rotation if tillage is kept to a minimum to preserve crop residues or if the wheat is stubble mulched.

Row crops, such as sorghum, cotton, and truck crops, rapidly deplete the fertility of the soil and should not be grown continuously. Generally, a row crop should be followed by a legume or by fallow before small grain is seeded. If low-residue row crops or truck crops are grown, a winter cover crop is needed to help control erosion. A winter cover crop that is adapted to cool weather and to a minimum supply of moisture should be selected.

Legumes, such as alfalfa, sweetclover, Austrian winter peas, and vetch, can be grown as high-producing forage crops or as cash crops in years of favorable moisture. The last growth of a legume in a crop rotation should be returned to the soil.

Grasses are important soil conditioners and should be considered in planning a long conservation cropping system. Native perennial grasses are better soil conditioners than introduced varieties.

The crops best suited to the soils and climate of the county include wheat, oats, rye, barley, sorghum, sudan, cotton, millet, alfalfa, vetch, cowpeas, soybeans, and sweetclover. Wheat is the most important cash crop. It is grown throughout the county but is better adapted to the more nearly level, loamy or clayey soils. It is rotated with other small grain, sorghum, and legumes.

[4] By EDWARD S. GROVER, soil scientist, Soil Conservation Service.

Alfalfa is suited to the soils on bottom lands and, in years of favorable rainfall, to the more nearly level uplands. Cotton can be grown on most soils in the county, but the total acreage in cotton is small.

Native grasses are grown principally on sandy, steeply sloping, or shallow soils to provide forage for livestock. These grasses are dependable forage producers in warm seasons. They are also good soil conditioners if rotated with other crops, and they are effective in controlling erosion.

Control of erosion.—Control of wind erosion and water erosion is needed in this county. The degree of control required depends on the soil, the topography, and the type of farming. Generally, some combination of practices is the most efficient way of achieving the control necessary. Among those that can be used are rotating crops, planting cover crops, farming on the contour, stubble mulching, practicing minimum tillage, deep plowing, stripcropping, building terraces and diversions, grassing waterways, and applying fertilizer. Of prime importance, whatever the combination of practices selected, is the production and management of crop residues needed to control erosion and to improve the tilth of the soils.

In selecting practices, the farmer considers the need for control of erosion, the cost of applying the practices required, and the production that can be achieved. Many combinations of practices are possible for a particular farm.

Minimum tillage.—Tillage should be kept to the minimum necessary to prepare a seedbed and to control erosion. Excessive tillage breaks down soil structure and destroys the protective residues. If the soil structure is damaged, the circulation of air is obstructed, the intake of water is impeded, and the soil is more likely to puddle when wet and to crust when dry. If residues are destroyed, the soil is more susceptible to damage by wind erosion.

Frequent tillage to the same depth tends to pack the soil just below plow depth and to create a compacted layer, called a plowpan, which obstructs the movement of air and moisture and restricts the development of roots (fig. 14). Loamy and clayey soils are most likely to be affected.

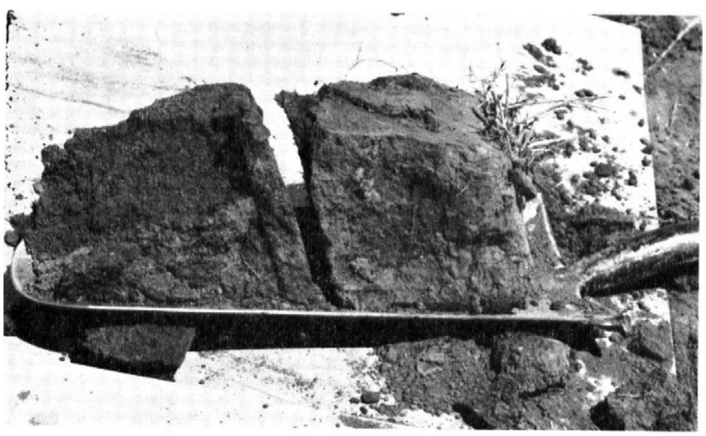

***Figure 14.*—Compacted soil and plowpan resulting from excessive tillage at the same depth.**

Cover crops.—A cover crop consists of close-growing grasses, legumes, or small grains that are grown in a crop rotation and are kept on the soil for 1 year or less. They are grown principally for soil protection, but they also add organic matter to the soil, increase productivity, and help to preserve soil structure.

Facts to consider in selecting a cover crop are (1) the time of year the crop will be growing, (2) the climatic conditions and the nature of the soil, (3) the length of the growing period before the crop will provide cover, and (4) the effect of the selected crop on the following crop.

If low-residue crops are grown, winter cover crops are needed to control wind erosion, particularly on the sandy soils. Rye and vetch are the principal cover crops, but other small grains and legumes are also grown. They can be seeded in cotton or in truck crops, before the cash crop is harvested, with drills designed especially for this purpose. Winter cover crops are not needed on fields planted to sorghum if protective amounts of stubble are left.

The seedbeds for most range and pasture plants need the protection of a cover crop until the seedlings become established. Sudan, millet, and close-rowed sorghum will provide a good cover for grass plantings. Millet and fall oats are best suited as a cover crop for legumes.

One objection to the use of a cover crop is that it uses much of the moisture needed for the growth of the following crop. The benefit of the cover crop, however, more than compensates for the moisture used.

Use of crop residues.—Residues of sorghum, small grain, and other crops can be left on the surface to protect the soil against erosion, or they can be turned under to provide organic matter. If the residues are used for these purposes, grazing and other uses should be restricted. If the amount of residue is large, nitrogen can be applied to speed decomposition. Clean tillage destroys residues.

Stubble mulching.—Stubble mulching is designed to keep a protective cover of crop residues on the surface until the next crop is seeded. This practice requires the use of sweeps, rod weeders, and blades that undercut the soil and leave residues on the surface.. The seeding equipment used must be capable of drilling through the trashy cover.

Many farmers who practice minimum tillage use chisels or sweeps to control weeds and to prepare seedbeds in fields from which wheat has been harvested. These implements leave most of the stubble on the surface. When residues are heavy, it is advisable to apply nitrogen to speed decomposition. This will prevent a reduction in the yields of the following crop.

Fertilization.—In the eastern part of the county, moderately sandy soils, such as the Farnum and Dill, and sandy soils, such as the Nobscot, are most likely to benefit from the use of fertilizers. These soils respond well to applications of nitrogen and phosphate (fig. 15). In years of adequate rainfall, loamy and clayey soils will also respond to applications of nitrogen and phosphate. Most soils in the county do not require lime.

Stripcropping.—This practice consists of growing a close-growing or erosion-resistant crop and a clean-tilled crop in alternate strips of equal width. The close-growing crop provides a barrier that breaks the force of the wind and protects the other crop. The width of the strips is determined by the erodibility of the surface soil. On sandy soils, such as the Nobscot, narrow strips are needed. The strips should be at right angles to the prevailing wind.

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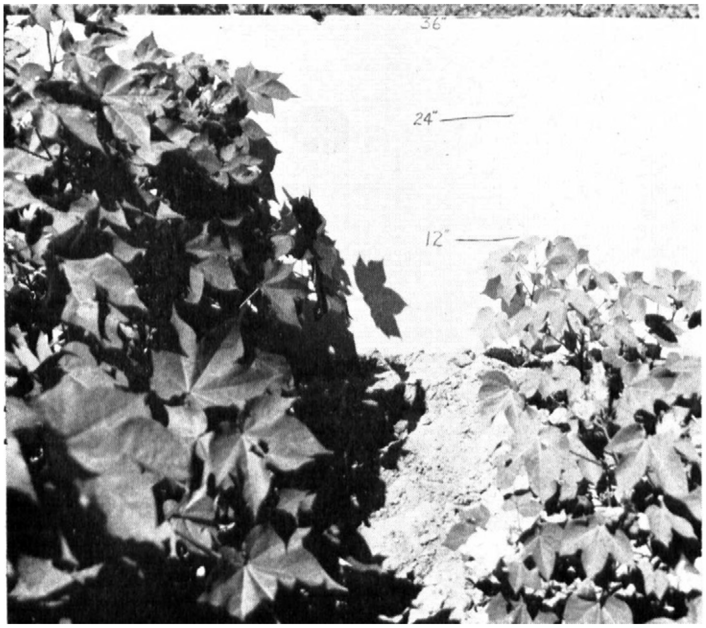

Figure 15.—Comparison in growth of cotton that was not fertilized and of cotton fertilized with ammonium phosphate, on Pratt fine sandy loam. The yield of unfertilized cotton was less than half of that produced by the fertilized cotton.

Field terraces and diversion terraces.—A terrace is a ridge, or a combination of a ridge and channel, built across the slope to divert or to stop the flow of water. Terraces are used to reduce erosion and to conserve moisture. They also serve as guidelines for contour farming. The differences between field terraces and diversion terraces are mainly those of size and purpose. A field terrace is designed mainly to slow or stop movement of water in a field; a diversion terrace, to protect a cultivated field from runoff from adjoining land. Most terrace systems need vegetated waterways for disposal of excess water.

In this county, where lack of moisture is one of the chief obstacles to good yields, field terraces appreciably improve crop yields by increasing the intake of water.

Grassed waterways.—Grassed waterways are broad, flat-bottomed, sodded channels. Either bermudagrass or native grass is commonly used for the vegetative cover. The waterways may have a retaining dike on each side if such is needed to increase their capacity. Their purpose is to dispose of excess water without causing erosion of fields. They are used to supplement natural drains where terrace systems, diversion terraces, or drainage or irrigation systems have been installed or are planned. They are not designed to control floodwaters from creeks, rivers, or very large drainage areas.

Each waterway has to be especially designed. The size of the area drained and the slope, erodibility, and permeability of the soil are important.

Control of weeds, crop diseases, and insects.—The control of weeds, crop diseases, and insects requires constant effort on the part of all farmers in Dewey County.

Bindweed, johnsongrass, and cheat are the more difficult weeds to control. Bindweed, a perennial, is propagated by seed and by the lateral creeping of roots. Generally, only small areas within a field are affected, but the acreage is increasing. A combination of tillage and chemical spraying can be used with limited success. Sterilizing the soil is practical if the areas are small, but this practice will make the soil unfit for crops for 2 to 4 years.

Johnsongrass is prevalent in all sections of the county. It is a perennial that propagates by seed and by rootstock. Continuous pasturing or frequent tillage through the growing season is the most effective control. Spot control by chemical treatment is practical in cultivated fields.

Cheat and other winter annuals, such as downy bromegrass and jointed goatgrass, are serious problems in wheatfields. They are propagated only by seed. The plants are difficult to kill, and the seed may lie dormant in the ground for many years. Cultivation is the most effective means of control, but in some fields it may be necessary to rotate wheat with summer-growing crops or to allow the soil to remain fallow for a while.

Smut and stem rust are the principal diseases of small grain. There are two types of smut, seedling infecting and floral infecting. Both types develop in the head of the plant and cause spores to form instead of grain. Smut can be controlled by using clean seed that has been chemically treated before planting. Stem rust causes reddish spots on plants and decreases yields by causing the grain to shrivel. It spreads more readily during cool, moist seasons. The use of resistant crop varieties is the best means of controlling this disease. Timeliness of planting may also minimize rust damage.

Root rot, stalk rot, smut, and various leaf blights are the most common diseases of sorghum. The use of resistant varieties and the rotation of crops are the only effective measures for controlling root rot, stalk rot, and leaf blights. Smut can be controlled by using clean, chemically treated seed.

In Dewey County, the insects most destructive to wheat and other small grain are greenbugs and cutworms. Chinch bugs and cornear worms sometimes damage sorghum. Bollworms, boll weevils, thrips, flea hoppers, and cabbage loopers may damage cotton. Spotted alfalfa aphids and webworms cause the most severe damage to alfalfa and other legumes. Chemical insecticides are the best means of controlling these pests. Farmers can contact their county agent or agricultural college for information on insecticides and application rates.

The growth of weeds along fence rows, in corners, and around fields provides a natural habitat for grasshoppers and other insects. Keeping weeds cut in these areas will help control insect infestation. Poison bran scattered near such areas also helps to control these pests.

Deep plowing.—Deep plowing helps to control wind erosion on soils that have a moderately coarse textured or coarse textured surface layer and a sandy clay subsoil not more than 24 inches below the surface. If properly done, deep plowing helps to control wind erosion and results in increased yields. For good results, one-fourth to one-third of the furrow slice must be in the heavier subsoil material. After deep plowing, a well-fertilized high-residue crop should be grown.

Deep plowing can be useless or even harmful on certain kinds of soils. The only soil suitable for deep plowing in Dewey County is Pratt loamy fine sand, heavy subsoil variant, undulating (fig. 16).

Emergency tillage.—Emergency tillage consists of roughening the surface soil so that it will resist blowing.

Figure 16.—**Deep plowing on Pratt loamy fine sand, heavy subsoil variant, undulating.**

This practice helps to hold the soil in place and to trap moving soil particles. Such tillage should be limited because it breaks down soil structure and reduces the supply of moisture. Generally, it is undertaken during periods of prolonged drought when the amount of vegetation is insufficient to prevent soil blowing. It is only a temporary means of erosion control. Commonly, whole areas have to be treated if emergency tillage is to be effective.

Farm ponds.—The farm ponds in the county supply water for livestock and provide a means of flood control and a source of recreation. They are a potential source of water for irrigation or home use.

Most ponds are formed by constructing an earthen fill across a creek or natural drainageway. A spillway is provided at one end or at both ends of the fill to release excess water. On continuously flowing creeks, pipes generally are installed to help discharge the constant flow of water.

Small temporary farm ponds, built to control gullying and to catch silt, are called erosion control dams. Their construction is similar to that of other farm ponds. Pipes are often used in these ponds to lower water rapidly.

Capability Groups of Soils

The capability classification is a grouping of soils that shows, in a general way, how suitable they are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment.

In this system all the kinds of soil are grouped at three levels—the capability class, the subclass, and the unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, grazing, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes there can be up to four subclasses. The subclass is indicated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* means that water in or on the soil will interfere with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c* indicates that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c*, because the soils in it have little or no erosion hazard but have other limitations that limit their use largely to pasture, range, woodland, or wildlife.

Within the subclasses are the capability units, groups of soils enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally identified by numbers assigned locally, for example, IIe-1 or IIIe-2.

Soils are classified in capability classes, subclasses, and units according to the degree and kind of permanent limitations; but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soil; and without consideration of possible but unlikely major reclamation projects.

The eight classes in the capability system and the subclasses and units in Dewey County are described in the list that follows.

Class I. Soils that have few limitations that restrict their use.

Unit I-1. Well-drained, loamy soils on bottom lands and low terraces that are seldom overflowed.

Class II. Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.

Subclass IIe. Soils that have a moderate risk of erosion if they are not protected.

Unit IIe-1. Deep, loamy soils on gently sloping uplands and high terraces.

Unit IIe-2. Moderately sandy soils on level to gently sloping uplands and terraces.

Subclass IIw. Soils that have moderate limitations because of excess water.
Unit IIw-1. Well drained and moderately well drained, loamy and moderately sandy soils on bottom lands that are occasionally overflowed.
Sublass IIc. Soils that have moderate climatic limitations.
Unit IIc-1. Deep, level or nearly level loamy soils on uplands and terraces.

Class III. Soils that have severe limitations that reduce the choice of plants, or require special conservation practices, or both.
Subclass IIIe. Soils subject to severe risk of erosion if they are cultivated and not protected.
Unit IIIe-1. Deep and moderately deep, loamy soils on sloping uplands.
Unit IIIe-2. Moderately sandy soils on gently sloping and sloping uplands.
Unit IIIe-3. Sandy soils in nearly level to undulating areas.
Unit IIIe-4. Moderately sandy soils on level to gently sloping uplands and river terraces.
Subclass IIIw. Soils that have severe limitations because of excess water.
Unit IIIw-1. Deep, poorly drained sandy and clayey soils in depressions or on undulating uplands.

Class IV. Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.
Subclass IVe. Soils subject to very severe risk of erosion if they are cultivated and not protected.
Unit IVe-1. Shallow to deep, loamy and clayey soils on sloping and strongly sloping uplands.
Unit IVe-2. Moderately sandy soils on sloping and strongly sloping uplands.
Unit IVe-3. Sandy soils on hummocky and sloping uplands.

Class V. Soils susceptible to little or no erosion but having other limitations, impractical to remove without major reclamation, that limit their use largely to pasture, range, woodland, or wildlife food and cover.
Subclass Vw. Soils generally unsuitable for cultivation because of moisture capacity or tilth.
Unit Vw-1. Loamy soils that have a permanently high water table and that are occasionally overflowed.
Unit Vw-2. Sandy soils that are frequently overflowed.

Class VI. Soils that have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture, range, woodland, or wildlife food and cover.
Subclass VIe. Soils severely limited, chiefly by risk of erosion if protective cover is not maintained.
Unit VIe-1. Sandy soils in duned areas.
Unit VIe-2. Moderately sandy soils mainly on steep to very steep slopes.
Unit VIe-3. Sandy soils that have a moderately sandy subsoil and that occur in duned areas.
Unit VIe-4. Shallow, loamy soils that occur on very steep slopes.
Unit VIe-5. Shallow, loamy soils and deep, sandy soils that occur on steep and very steep slopes.
Unit VIe-6. Severely eroded, loamy and clayey soils.
Unit VIe-7. Shallow and moderately deep, loamy soils that occur in strongly sloping to very steeply sloping areas.
Unit VIe-8. Severely eroded, sandy soils.
Unit VIe-9. Shallow and moderately deep, clayey soils that occur in strongly sloping to very steeply sloping areas.

Class VII. Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation, and that restrict their use largely to grazing, woodland, or wildlife.
Subclass VIIe. Soils very severely limited, chiefly by risk of erosion if protective cover is not maintained.
Unit VIIe-1. Shallow, loamy soils that occur in very steeply sloping or broken areas.
Unit VIIe-2. Loose sandy soils that occur in duned areas.

Class VIII. Soils and landforms that have limitations that preclude their use, without major reclamation, for commercial production of plants and restrict their use to recreation, wildlife, water supply, or esthetic purposes. (There are no class VIII soils in Dewey County.)

Management by Capability Units

All of the soils in one capability unit have about the same limitations and similar risks of damage. Therefore, all soils in a unit need about the same kind of management, though they may have formed from different kinds of parent material and in different ways. In the following pages the soils in each unit are listed and management practices for the soils in each unit are mentioned.

Capability unit I-1

This unit consists of deep, well-drained, dark-colored loamy soils on level or nearly level bottom lands and low river terraces. The soils in this unit are—

Canadian loam.
Port silt loam.
Spur clay loam, deep water table.
Tipton silt loam, 0 to 1 percent slopes.

These soils are permeable, and they have a high capacity for storing moisture and plant nutrients. The water table is within the reach of deep-rooted plants. Runoff from higher areas is beneficial to crops but may be difficult to control in some areas. Preventing compaction and surface crusting and maintaining fertility are minor problems.

The principal crops are small grain, sorghum, cotton, and alfalfa, but all crops and grasses common in the area can be grown. Yields are high.

In planning a cropping system for these soils, keep the plan flexible so that it can be changed if climatic or economic conditions change. Base the system on the following fundamentals: Grow high-residue crops 50 percent of the time; do not grow row crops more than 3 years

in succession; and maintain a soil-building program. A soil-building program can be maintained in one of three ways: (1) Grow only high-residue crops, and manage the residues for soil building; (2) grow a legume crop once each 6 years; or (3) grow perennial grasses as part of a crop rotation. For example, a cash-crop farmer can grow wheat continuously and manage the stubble for soil building; or he can grow cotton for 3 years, then sweetclover for 2 years, and oats or barley for 1 year or more. A livestock farmer can grow rowed sorghum for as long as 3 consecutive years and then seed perennial grasses or alfalfa.

Some special practices are needed to support a conservation cropping system. Where runoff from higher areas is a problem, construct diversion terraces and vegetated waterways. Where it is necessary to conserve moisture, construct water-impounding terraces, or farm on the contour. To control erosion, keep a growing crop on the soils, or leave protective amounts of residues on the surface. Vary the depth of tillage to prevent the formation of a plowpan. Keep tillage to a minimum to protect crop residues and to prevent compaction.

Capability unit IIe-1

This unit consists primarily of deep, dark-colored, well-drained, loamy soils on gently sloping uplands and high terraces. The soils in this unit are—

Carey silt loam, 1 to 3 percent slopes.
Enterprise very fine sandy loam, 1 to 3 percent slopes.
Holdrege silt loam, 1 to 3 percent slopes.
St. Paul silt loam, 1 to 3 percent slopes.
Woodward-Carey complex, 1 to 3 percent slopes.

These soils are fertile, and they have a high capacity for storing moisture. They are all moderately permeable except the St. Paul soil, which has a slowly permeable subsoil. Water erosion is a hazard if these soils are cultivated. Management problems include conserving moisture, preventing compaction and surface crusting, controlling runoff, and maintaining fertility.

The principal crops are small grain, grain sorghum, and cotton. Forage sorghum, alfalfa, and other legumes do well in years of high rainfall. Yields of perennial grasses are high.

In planning a cropping system for these soils, keep the plan flexible so that it can be changed if climatic or economic conditions change. Base the system on the following fundamentals: Grow high-residue crops 50 percent of the time; do not grow row crops more than 3 years in succession; and maintain a soil-building program. A soil-building program can be maintained in one of three ways: (1) Grow only high-residue crops, and manage the residues for soil building; (2) grow a legume crop once each 6 years; or (3) grow perennial grasses as part of a crop rotation. For example, cotton can be grown for 3 years, then sweetclover can be grown in a wet year, then a few crops of wheat; or sweetclover can be grown in wet years and rotated with grain sorghum.

To support a conservation cropping system, construct terraces on all slopes of 2 percent or more, and farm these slopes on the contour; or keep the slopes in sown or close-rowed crops. Conserve moisture by constructing water-impounding terraces. Construct diversion terraces and vegetated waterways where runoff is a problem. Vary the depth of tillage, and keep tillage to a minimum. To control erosion, keep the soils in growing crops throughout the year, or leave protective amounts of crop residues on the surface.

Capability unit IIe-2

This unit consists principally of deep, dark-colored or reddish, well-drained moderately sandy soils that occur on level to gently sloping uplands and terraces. The soils in this unit are—

Farnum fine sandy loam, 0 to 1 percent slopes.
Miles fine sandy loam, 0 to 1 percent slopes.
Woodward-Dill fine sandy loams, 0 to 3 percent slopes.
Yahola fine sandy loam, high.

These soils absorb moisture readily, and they have a moderate capacity to store moisture and plant nutrients. Continued cropping reduces their fertility, but their response to additions of fertilizer and organic matter is good. They are susceptible to both wind erosion and water erosion. Water from higher lying soils ponds in some areas after heavy rains. Conserving moisture is also a management problem.

The principal crops are small grain and grain sorghum. Forage sorghum or alfalfa, or legumes other than alfalfa, can be grown in years of average rainfall. Forage production is good.

In planning a cropping system for these soils, keep the plan flexible so that it can be changed if climatic or economic conditions change. Base the system on the following fundamentals: Grow high-residue crops 50 percent of the time; do not grow row crops more than 4 years in succession; and maintain a soil-building program. A soil-building program can be maintained in one of three ways: (1) Grow only high-residue crops, and manage the residues for soil building; (2) grow a legume crop once each 6 years; or (3) grow perennial grasses as part of a crop rotation. For example, a farmer can grow cotton and sorghum in rotation and seed perennial grasses occasionally for soil building; or he can grow wheat in rotation with barley or oats and manage the residues for soil building.

To support a conservation cropping system, keep the soils in growing crops or leave adequate amounts of residues on the surface to control erosion. On soils that are not terraced, keep the direction of the rows crossways to the prevailing wind. If necessary, stripcrop to help control wind erosion. Keep tillage to a minimum. Vary the depth of tillage to prevent the formation of a plowpan. Grow only close-rowed or sown crops on slopes of 2 percent or more, or construct terraces on these slopes and farm on the contour. Construct water-impounding terraces where conserving moisture is necessary.

Capability unit IIw-1

In this unit are loamy and moderately sandy soils on bottom lands that are occasionally overflowed. The soils in this unit are—

Wann soils.
Yahola fine sandy loam.

These soils are fertile, and the water table is usually within the reach of most plants. The principal management problems are controlling floodwater, preventing

compaction and surface crusting, and maintaining fertility. Wind erosion is a slight hazard.

Alfalfa, forage sorghum, small grain, grain sorghum, cotton, legumes, and grasses are well suited. Yields of bermudagrass are large for both hay and pasture.

In planning a cropping system for these soils, keep the plan flexible so that it can be changed if climatic or economic conditions change. Base the system on the following fundamentals: Grow high-residue crops 50 percent of the time; do not grow row crops more than 3 years in succession; and maintain a soil-building program. A soil-building program can be maintained in one of three ways: (1) Grow only high-residue crops, and manage the residues for soil building; (2) grow a legume crop once each 6 years; or (3) grow perennial grasses as part of a crop rotation. For example, a farmer can grow cotton or sorghum for 2 or 3 years, then alfalfa; or he can rotate wheat with perennial grasses that are grown for seed.

Some special practices are needed to support a conservation cropping system. Where runoff from higher areas is a problem, construct diversion terraces and vegetated waterways. If practical, construct a simple drainage system. To control erosion, protect the soil with growing plants or crop residues. Vary depth of tillage to prevent the formation of a plowpan. Keep tillage to a minimum to prevent compaction and to protect crop residues.

Capability unit IIc-1

This unit consists of deep, dark-colored loamy soils on level or nearly level uplands and terraces. The soils in this unit are—

Enterprise very fine sandy loam, 0 to 1 percent slopes.
Holdrege silt loam, 0 to 1 percent slopes.
St. Paul silt loam, 0 to 1 percent slopes.

These soils are well drained and permeable. They can store large amounts of moisture and are high in natural fertility. Conserving moisture is the principal management problem. Minor problems are preventing compaction and surface crusting and maintaining fertility.

The principal crops are small grain, sorghum, and legumes. Cotton is important in the vicinity of Leedey. Perennial crops, such as alfalfa, may not survive long periods of drought.

In planning a cropping system for these soils, keep the plan flexible so that it can be changed if climatic or economic conditions change. Base the system on the following fundamentals: Grow high-residue crops 50 percent of the time; do not grow row crops more than 3 years in succession; and maintain a soil-building program. A soil-building program can be maintained in one of three ways: (1) Grow only high-residue crops, and manage the residues for soil building; (2) grow a legume crop once each 6 years; or (3) grow perennial grasses as part of a crop rotation. For example, a cash-crop farmer can grow grain sorghum for 2 or 3 years, allow the field to remain fallow for one year, and then grow wheat for several years, and manage the residues each year for soil building. A livestock farmer can grow forage sorghum for as long as 3 consecutive years, and then seed perennial grasses. He should try to plant the sorghum in wet years.

Some special practices are needed to support a conservation cropping system. To conserve moisture, construct water-impounding terraces and farm on the contour. Keep tillage to a minimum to prevent compaction and to protect crop residues. Vary the depth of tillage to prevent the formation of a plowpan. Construct diversion terraces and vegetated waterways where runoff is a problem. To control erosion, keep a growing crop on the soil or leave crop residues on the surface.

Capability unit IIIe-1

In this unit are loamy, well-drained soils on sloping uplands. The soils in this unit are—

Carey silt loam, 3 to 5 percent slopes.
St. Paul silt loam, 3 to 5 percent slopes.
Woodward loam, 3 to 5 percent slopes.

These soils are moderately fertile. They have moderate to high water-holding capacity. All are readily permeable except the St. Paul soil, which is slowly permeable. Water erosion is a severe hazard on all these soils. Management problems include conserving moisture, controlling runoff, preventing compaction and surface crusting, and maintaining fertility.

The most suitable crops are small grain, grain sorghum, legumes, and grasses.

In planning a cropping system for these soils, keep the plan flexible so that it can be changed if climatic or economic conditions vary. Base the system on the following fundamentals: Grow high-residue crops 60 percent of the time; do not grow row crops more than 2 years in succession; and maintain a soil-building program. A soil-building program can be maintained in one of three ways: (1) Grow only high-residue crops, and manage the residues for soil building; (2) grow a legume crop once each 5 years; or (3) grow perennial grasses as part of a crop rotation. For example, a farmer can grow grain sorghum in rows for 2 years, then sow sorghum for 2 or more years, and manage all crop residues for soil building; or he can grow wheat, and plant sweetclover occasionally in wet years.

To protect these soils, construct a complete terrace system and farm on the contour. Keep the soil in growing crops or leave crop residues on the surface. Build diversion terraces and vegetated waterways where runoff is a problem. Keep tillage to a minimum to prevent soil compaction and to protect residues. Vary the depth of tillage to reduce the formation of a plowpan.

Capability unit IIIe-2

This unit consists of moderately sandy, well-drained soils on gently sloping and sloping uplands. The soils in this unit are—

Dill fine sandy loam, 1 to 5 percent slopes.
Enterprise fine sandy loam, 3 to 5 percent slopes.
Miles fine sandy loam, 1 to 3 percent slopes, eroded.
Miles fine sandy loam, 3 to 5 percent slopes.

These soils absorb moisture readily, but they are somewhat limited in their capacity to store moisture. Originally, they were moderately fertile, but their fertility has been rapidly depleted by continued cropping. Both wind erosion and water erosion are severe hazards. Management problems include controlling erosion, conserving moisture, and preserving soil structure.

The most suitable crops are small grain, grain sorghum, and such legumes as sweetclover and vetch. Grass yields are high.

In planning a cropping system for these soils, keep the plan flexible so that it can be changed if climatic or economic conditions change. Base the system on the following fundamentals: Grow high-residue crops 60 percent of the time; do not grow row crops more than 4 years in succession; and maintain a soil-building program. A soil-building program can be maintained in one of three ways: (1) Grow only high-residue crops, and manage the residues for soil building; (2) grow a legume crop once each 5 years; or (3) grow perennial grasses as part of a crop rotation. For example, a cash-crop farmer can grow grain sorghum for as long as 4 years, then follow with 2 to 4 years of wheat, or a similar sown crop, and manage all crop residues for soil building. A livestock farmer interested in growing forage might prefer to grow sudan or millet in a rotation with rye and vetch.

To support a conservation cropping system, keep a protective vegetative cover on the soils at all times. On soils that are not terraced, keep the direction of the crop rows crossways to the prevailing wind. Stripcrop if additional protection is necessary. Keep tillage to a minimum, and vary the depth of tillage. Construct terraces on slopes of 3 percent or more. Plant only sown or close-rowed crops on slopes of 2 to 3 percent. Farm all terraced fields on the contour. On the Enterprise and Dill soils, only level terraces with blocked ends are suitable, except where vegetated waterways have already been established. Construct diversion terraces and vegetated waterways where runoff is excessive.

Capability unit IIIe-3

Deep, sandy soils in nearly level to undulating areas make up this unit. They are—

Brazos loamy fine sand.
Pratt loamy fine sand, heavy subsoil variant, undulating.
Pratt loamy fine sand, undulating.

These soils are low in natural fertility, but they respond to additions of fertilizer. They absorb moisture readily, but their capacity for storing moisture varies from moderately high for Pratt loamy fine sand, heavy subsoil variant, undulating, to low for the other two soils. Wind erosion is a severe hazard. Other management problems are conserving moisture, preserving soil structure, and maintaining fertility.

Crops such as rye, vetch, cowpeas, sudan, and millet, which can be used for temporary pasture, for hay, or for cash crops, are best suited. Wheat, barley, sorghum, and legumes can be grown in years of high rainfall. Some truck crops can be grown successfully on Pratt loamy fine sand, heavy subsoil variant, undulating.

In planning a cropping system for these soils, keep the plan flexible so that it can be changed if climatic or economic conditions change. Base the system on the following fundamentals: Grow high-residue crops 75 percent of the time; do not grow row crops more than 4 years in succession; and maintain a soil-building program. A soil-building program can be maintained in one of three ways: (1) Grow only high-residue crops, and manage the residues for soil building; (2) grow a legume crop once each 4 years; or (3) grow perennial grasses as part of a crop rotation. For example, a farmer can grow wheat during years of high rainfall, then rye and vetch for temporary pasture, and use the residues of both the wheat and the pasture crop for soil building; or he can grow a truck crop for 2 years, and then high residue producing crops, such as small grain and legumes, for 6 years.

To control wind erosion, protect these soils with a growing crop or crop residues throughout the year. Keep the direction of the rows crossways to the prevailing wind. Stripcrop if additional protection is needed. Keep tillage to a minimum to protect crop residues and to prevent compaction. Vary the depth of tillage to prevent the formation of a plowpan. In some places, Pratt loamy fine sand, heavy subsoil variant, undulating, can be deep plowed successfully. Before deep plowing, however, make a detailed study of the area. A soil should be deep plowed only if the subsoil is finer textured than the surface layer. The subsoil should be at least 20 percent clay and must be within 24 inches of the surface.

Capability unit IIIe-4

The soils of this unit are deep, brown to dark brown, and moderately sandy. They occur on level to gently sloping uplands and river terraces. They are—

Enterprise fine sandy loam, 0 to 3 percent slopes.
Miles fine sandy loam, 1 to 3 percent slopes.
Pratt fine sandy loam, 1 to 3 percent slopes.

These soils are well drained. They absorb moisture readily and have a moderate capacity to store moisture and plant nutrients. They respond to additions of organic matter and of fertilizer. Management problems include controlling both wind and water erosion and conserving moisture.

The principal crops are small grain and grain sorghum. Forage sorghum, or alfalfa, or legumes other than alfalfa can be grown in years of favorable rainfall. In areas used for range, the production of forage is good.

In planning a cropping system for these soils, keep the plan flexible so that it can be changed if climatic or economic conditions change. Base the system on the following fundamentals: Grow high-residue crops 50 percent of the time; do not grow row crops more than 4 years in succession; and maintain a soil-building program. A soil-building program can be maintained in one of three ways: (1) Grow only high-residue crops, and manage the residues for soil building; (2) grow a legume crop once each 6 years; or (3) grow perennial grasses as part of a crop rotation. For example, cotton and sorghum can be rotated, and perennial grasses can be grown occasionally for soil building; or wheat can be rotated with barley or oats, and the residues managed for soil building.

Some special practices are needed to support a conservation cropping system. To control erosion, keep the soils in growing crops, or leave adequate amounts of residues on the surface. On soils that are not terraced, keep the direction of the crop rows crossways to the prevailing wind. Stripcrop if additional protection is needed. Vary the depth of tillage to prevent the formation of a plowpan, and keep tillage to a minimum to maintain good tilth. Plant only close-rowed or sown crops on slopes of 2 percent or more, or construct terraces on these slopes and farm on the contour. Construct water-impounding terraces where it is necessary to conserve moisture.

Capability unit IIIw-1

This unit consists of sandy and clayey soils on undulating uplands and in depressions. The soils in this unit are—

Carwile-Pratt complex.
Lofton clay loam.

The clayey Carwile and Lofton soils are fertile but are poorly drained and may remain ponded for several days after rains. The sandy Pratt soil is well drained, but it is low to moderate in fertility, and it is susceptible to wind erosion. Uneven distribution of water, conservation of moisture, and maintenance of soil structure are other management problems.

The principal crops are small grain, sorghum, and legumes grown either as a cash crop or as temporary pasture.

In planning a cropping system for these soils, keep the plan flexible so that it can be changed if climatic or economic conditions change. Base the system on the following fundamentals: Grow high-residue crops 50 percent of the time; do not grow row crops more than 3 years in succession; and maintain a soil-building program. A soil-building program can be maintained in one of three ways: (1) Grow only high-residue crops, and manage the residues for soil building; (2) grow a legume crop once each 6 years; or (3) grow perennial grasses as part of a crop rotation. For example, a farmer who needs forage for livestock can grow sorghum for silage for 2 or 3 years, then rye and vetch for a few years. A cash-crop farmer can grow wheat continuously, or he can rotate wheat with fallow or with Austrian winter peas.

To control erosion, keep the direction of the crop rows crossways to the prevailing wind. Terrace all slopes of 2 percent or more, or grow only sown or close-rowed crops on these slopes. Farm all terraced fields on the contour, and stripcrop fields that are not terraced if additional protection is needed. Keep crop residues or a growing crop on the soils. Keep tillage to a minimum to prevent compaction and to protect crop residues. Vary the depth of tillage to prevent the formation of a plowpan. Where the uneven distribution of water or runoff from higher areas is a problem, construct diversion terraces and vegetated waterways. Water-impounding terraces will also help to distribute water and to conserve moisture. Where practical, construct simple drainageways to remove excess water.

Capability unit IVe-1

This unit is made up of shallow to deep, loamy and clayey soils on sloping and strongly sloping uplands. The soils in this unit are—

Carey silt loam, 5 to 8 percent slopes.
Quinlan-Woodward loams, 3 to 5 percent slopes, eroded.
St. Paul clay loam, 3 to 5 percent slopes, eroded.
Woodward-Carey complex, 3 to 5 percent slopes, eroded.
Woodward-Carey complex, 5 to 8 percent slopes, eroded.
Woodward-Quinlan loams, 3 to 5 percent slopes.

These soils are moderate to low in fertility. Although they have moderate to high water-holding capacity, much of the available water is lost through runoff. Water erosion is a severe hazard. Management problems include conserving moisture, preventing compaction and surface crusting, controlling runoff, and maintaining fertility.

The best use for these soils is pasture or range. If they are cultivated, the most suitable crops are small grain, grain sorghum, sweetclover, and grasses for temporary pasture.

If these soils are cultivated, plan a cropping system but keep the plan flexible so that it can be changed if climatic or economic conditions change. Base the system on the following fundamentals: Grow only sown or close-rowed crops that produce large amounts of residues, and maintain a soil-building program. A soil-building program can be maintained in one of two ways: (1) Manage all residues for soil building, and grow a legume crop once each 4 years; or (2) grow perennial grasses as part of a crop rotation. For example, wheat can be grown in periods of high rainfall and followed by perennial grasses, or sudan can be grown and followed by sweetclover or grasses.

To support a conservation cropping system, construct a complete terrace system, and farm on the contour. Keep the soils in growing crops, or leave crop residues on the surface. Keep tillage to a minimum, and vary the depth of tillage. Build diversion terraces and vegetated waterways where runoff is excessive.

Capability unit IVe-2

In this capability unit are moderately sandy soils on sloping and strongly sloping uplands. The soils in this unit are—

Dill fine sandy loam, 3 to 8 percent slopes, eroded.
Dill fine sandy loam, 5 to 8 percent slopes.
Enterprise fine sandy loam, 5 to 8 percent slopes.
Miles fine sandy loam, 3 to 5 percent slopes, eroded.
Miles fine sandy loam, 5 to 8 percent slopes.
Miles fine sandy loam, 5 to 8 percent slopes, eroded.

These soils are only moderately fertile, but they respond to additions of fertilizers. Although they are readily permeable, they are only moderate in moisture-holding capacity. Much of the available water is lost through surface runoff. Both water erosion and wind erosion are serious hazards. Other management problems are conserving moisture, preserving soil structure, and maintaining fertility.

These soils are best used as pasture or range. If cultivated, they are best suited to rye, to sudan, and to such legumes as sweetclover, vetch, and cowpeas. Wheat, barley, and sown sorghum can be grown in years of adequate rainfall.

If these soils are cultivated, plan a cropping system but keep the plan flexible so that it can be changed if climatic or economic conditions change. Base the system on the following fundamentals: Grow only sown or close-rowed crops that produce large amount of residues, and maintain a soil-building program. A soil-building program can be maintained in one of two ways: (1) Manage all residues for soil building, and grow a legume crop once each 4 years; or (2) grow perennial grasses as part of a crop rotation. For example, sudan can be grown for 2 or 3 years and followed by sweetclover or cowpeas in a year when moisture is adequate, or perennial grasses can be grown for temporary pasture and, in periods of high rainfall, rotated with wheat.

If the soils are cultivated, construct terraces and farm on the contour. On Dill and Enterprise soils, construct only level terraces with blocked ends unless well-established, vegetated waterways have already been constructed. Construct diversion terraces and vegetated waterways where runoff is excessive. Keep the soils in growing crops,

or leave crops residues on the surface. Stripcrop if additional protection is needed to control erosion. Keep tillage to a minimum, and vary the depth of tillage.

Capability unit IVe-3

The sandy soils that make up this unit are on hummocky and sloping uplands. They are—

Nobscot-Pratt complex, hummocky.
Pratt loamy fine sand, hummocky.

These soils are low in fertility but respond to additions of fertilizers. They absorb moisture readily and lose only a small or moderate amount of water through runoff, but they are low in moisture-holding capacity. Wind erosion is a serious hazard. Water erosion is sometimes a hazard on Nobscot-Pratt complex, hummocky. Management problems include controlling erosion, conserving moisture, preserving soil structure, and maintaining fertility.

These soils are best used for pasture or range. If they are cultivated, the most suitable crops are rye, sudan, and millet. In years of high rainfall, wheat, barley, sorghum, and such legumes as sweetclover, vetch, and cowpeas can be grown successfully.

If these soils are cultivated, plan a cropping system but keep the plan flexible so that it can be changed if climatic or economic conditions change. Base the system on the following fundamentals: Grow only crops that produce large amount of residues, and maintain a soil-building program. A soil-building program can be maintained in one of two ways: (1) Manage all residues for soil building, and grow a legume crop once each 4 years; or (2) grow perennial grasses as part of a crop rotation. For example, sudan can be grown for temporary pasture for 2 years, then wheat can be grown for 1 year, if moisture is favorable, and the wheat can be followed by sweetclover.

To support a conservation cropping system, keep the soils in growing crops, or leave crop residues on the surface. Keep the direction of the rows crossways to the prevailing wind, and stripcrop if additional protection is needed. Keep tillage to a minimum to protect residues and to prevent pulverizing the soils.

Capability unit Vw-1

This unit consists of one land type, Alluvial land, which occurs on flood plains that are occasionally overflowed. Normally, it is of limited use for cultivated crops because of the high water table. Possibly, it could be cultivated successfully during long periods of drought.

Yields of perennial grasses for forage are high. Cutting these grasses for hay is often profitable. Management for hay and pasture is discussed in the section "Range Management" under the heading "Subirrigated Range Site."

Capability unit Vw-2

This unit consists only of Lincoln soils. These are youthful, sandy soils that have a fluctuating water table and are frequently overflowed. They occur on bottom lands along creeks, where the stream channel meanders back and forth across them, and on broad bottom lands along rivers, where in many places they extend into the river channel.

These soils are not suited to cultivated crops or to grasses to be cut for hay, but if well managed they are productive of perennial grasses for forage. Suggestions for management are given in the section "Range Management" under the heading "Sandy Bottom Land Range Site."

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Capability unit VIe-1

This unit consists of Pratt-Tivoli loamy fine sands. These sandy soils occur in duned areas. They absorb water readily but are low in moisture-holding capacity. They are not suited to cultivation, because of steep slopes and susceptibility to wind erosion.

These soils normally support a dense cover of sand sagebrush, but they are capable of producing good yields of tall grasses. Generally, grass production can be increased by controlling the brush. Suggestions for management are given in the section "Range Management" under the heading "Deep Sand Range Site."

Capability unit VIe-2

In this unit are moderately sandy soils that occur mainly on steep to very steep slopes. The soils in this unit are—

Broken land.
Enterprise fine sandy loam, 8 to 20 percent slopes.

Although these soils absorb water readily, they lose much of the available water through surface runoff. They are not suited to cultivation, because of the extreme hazard of erosion.

Grass production is moderate to high. Tall native grasses will grow profusely if the soils are well managed, but normally there is a considerable amount of sand sage and skunkbush in the grass cover. Suggestions for management are given in the section "Range Management" under the heading "Sandy Prairie Range Site."

Capability unit VIe-3

The only soil in this unit, Nobscot fine sand, rolling, occurs in steeply sloping or duned areas. This soil is low in fertility and droughty. It is too steep and too erodible to be used for crops. Much of the acreage has a cover of blackjack oak and post oak and a limited amount of tall grasses between the trees. Suggestions for management are given in the section "Range Management" under the heading "Deep Sand Savannah Range Site."

Capability unit VIe-4

There is only one soil in this unit, Quinlan loam. This is a shallow, loamy soil that occurs on very steep slopes. It stores only small amounts of moisture and plant nutrients. Much of the available water is lost through surface runoff.

This soil is too steep or too erodible to be used for crops. It will produce moderate amounts of tall and mid grasses if properly managed. Suggestions for management are given in the section "Range Management" under the heading "Shallow Prairie Range Site."

Capability unit VIe-5

This unit consists of Quinlan-Enterprise complex, which is made up of shallow, loamy soils and deep, sandy soils and occurs primarily on steep and very steep slopes. The shallow soils and the many gravelly knobs are droughty. The deep, sandy soils supply sufficient moisture for grasses.

These soils are not suitable for cultivation, but they will produce large amounts of grass for forage if properly managed. Suggestions for management are given in the section "Range Management" under the headings "Shallow Prairie Range Site" and "Sandy Prairie Range Site."

Capability unit VIe–6

This unit consists of severely eroded, loamy and clayey soils that occur primarily in sloping and strongly sloping areas. The soils in this unit are—

Quinlan soils, severely eroded.
Vernon soils, severely eroded.

These soils are not suitable for cultivation. If measures are taken to control erosion, native grasses may provide limited grazing. Suggestions for management are given in the section "Range Management" under the heading "Eroded Prairie Range Site."

Capability unit VIe–7

This unit consists of Quinlan-Woodward loams, 5 to 20 percent slopes. These are shallow and moderately deep, loamy soils that occur in strongly sloping to very steeply sloping areas. They make up much of the range in Dewey County.

These soils are low in fertility and low in water-holding capacity. They are too steep and too erodible to be cultivated. If carefully managed, they will produce fairly good yields of mid and tall native grasses. Suggestions for management are given in the section "Range Management" under the headings "Shallow Prairie Range Site" and "Loamy Prairie Range Site."

Capability unit VIe–8

This unit consists of Eroded sandy land, which is sloping and strongly sloping and so much eroded that it cannot be used for crops.

If perennial grasses are grown and other measures are taken to control erosion, this land may provide limited grazing. Suggestions for management are given in the section "Range Management" under the heading "Eroded Sandy Land Range Site."

Capability unit VIe–9

Soils of the Vernon complex make up this unit. These clayey soils occur in strongly sloping to very steeply sloping areas. They are shallow to moderately deep, low in fertility, and limited in water-holding capacity. They are too steep and too erodible to be cultivated.

These soils will produce moderate amounts of short and mid native grasses for forage if properly managed. Suggestions for management are given in the section "Range Management" under the headings "Red Clay Prairie Range Site" and "Red Shale Range Site."

Capability unit VIIe–1

Rough broken land, which occupies very steeply sloping or broken areas, makes up this unit. These areas cannot be used for crops, and their use for range is restricted because of their limited accessibility to livestock.

Little grass grows on the steep slopes, but a moderate amount grows in the small pockets and on the bottoms of the canyons. Suggestions for management are given in the section "Range Management" under the heading "Breaks Range Site."

Capability unit VIIe–2

This unit consists of Tivoli fine sand. This deep, loose, sandy soil occurs in duned areas. It is too steep and too erodible to be used for crops, and its use for range is limited because the vegetation is sparse.

If properly managed, this soil will produce a limited amount of tall grass for forage. Suggestions for management are given in the section "Range Management" under the headings "Deep Sand Range Site" and "Dune Range Site."

Estimated Yields of Crops

In table 6 are estimated long-term average acre yields for the principal crops grown in the county on soils in capability units I, II, III, and IV.

Yields, based on dryland farming, are given under two levels of management. In columns A are yields to be expected under common management, which includes few conservation measures. Yields will be much lower than those shown if methods of farming are abusive. In columns B are yields to be expected under improved management, which includes controlling erosion, conserving moisture, using crop residues, and applying some fertilizers. Under intensive management that includes irrigation, drainage, and maximum fertilization, yields will be much higher than those shown in table 6.

The figures shown in columns A are based largely on actual yields where records were available, on observations made by members of the soil survey party, and on information obtained by interviews with farmers and ranchers who have had experience with the soils and crops of the area. Crop failures were considered in estimating average yields.

Irrigation

At the present time, little irrigation is done in the county. Fewer than 20 systems have been developed. Many of these are of the sprinkler type. Most of these systems irrigate less than 80 acres, although there are some that have the capacity to irrigate a quarter section or more. Wells supply most of the water. Only a few storage reservoirs are used.

Most of the irrigation water is applied to alfalfa and forage sorghum. These crops are commonly fed to livestock by the producing farmer. Small grain, cotton, grain sorghum, and some specialized crops are irrigated to some extent.

Water for irrigation is not plentiful, but there are several potential sources in the county. A few wells provide more than 500 gallons of water per minute, but the possibility of a large number of such wells is slight. Reservoirs built to store runoff are probably the best potential sources of water that can be developed in the county. Reservoirs should be large enough to store enough water to last through periods of drought. The Canton Reservoir and the large flood-detention reservoirs that have been built on Barnitz Creek are also possible sources of water for irrigation.

TABLE 6.—*Estimated average acre yields of principal crops on soils suited to cultivation*

[Yields in columns A are those obtained under prevailing management; those in columns B are yields to be expected under improved management. Absence of a yield figure indicates the crop is not commonly grown on the soil at the specified level of management]

Map symbol	Soil	Wheat		Barley		Grain sorghum		Forage[1] sorghum		Cotton (lint)		Alfalfa[2]	
		A	B	A	B	A	B	A	B	A	B	A	B
		Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Tons*	*Tons*
Bf	Brazos loamy fine sand	9	12	15	18	17	20	3	4	100	150	1.0	1.2
Ca	Canadian loam	19	22	28	30	22	30	7	8	300	350	1.6	2.0
CeB	Carey silt loam, 1 to 3 percent slopes	14	16	22	24	20	26	5	6	175	225	.8	1.0
CeC	Carey silt loam, 3 to 5 percent slopes	11	13	19	21	18	23	3	4	125	175	-----	-----
CeD	Carey silt loam, 5 to 8 percent slopes	8	10	14	16	15	18	-----	-----	-----	-----	-----	-----
Cp	Carwile-Pratt complex	13	16	20	23	22	26	5	6	150	225	.8	1.0
DfC	Dill fine sandy loam, 1 to 5 percent slopes	11	14	18	21	19	22	4	5	125	175	-----	-----
DfD2	Dill fine sandy loam, 3 to 8 percent slopes, eroded	6	8	11	13	13	15	-----	-----	50	100	-----	-----
DfD	Dill fine sandy loam, 5 to 8 percent slopes	8	10	13	15	15	17	-----	-----	-----	-----	-----	-----
EfB	Enterprise fine sandy loam, 0 to 3 percent slopes	13	16	22	25	22	25	5	6	175	275	1.2	1.6
EfC	Enterprise fine sandy loam, 3 to 5 percent slopes	9	12	17	19	16	20	3	4	150	250	-----	-----
EfD	Enterprise fine sandy loam, 5 to 8 percent slopes	5	8	12	15	13	17	-----	-----	-----	-----	-----	-----
EnA	Enterprise very fine sandy loam, 0 to 1 percent slopes	17	21	27	29	25	29	6	7	275	325	1.3	2.0
EnB	Enterprise very fine sandy loam, 1 to 3 percent slopes	15	18	23	25	21	26	5	6	225	300	1.0	1.6
FaA	Farnum fine sandy loam, 0 to 1 percent slopes	16	18	24	26	25	27	6	7	200	250	.8	1.0
HoA	Holdrege silt loam, 0 to 1 percent slopes	18	22	27	29	27	29	6	7	250	300	1.3	1.8
HoB	Holdrege silt loam, 1 to 3 percent slopes	15	18	25	27	25	27	5	6	200	250	1.0	1.3
Lo	Lofton clay loam	12	16	24	26	19	23	5	6	225	300	-----	-----
MfA	Miles fine sandy loam, 0 to 1 percent slopes	15	17	23	25	24	27	5	6	200	250	-----	-----
MfB	Miles fine sandy loam, 1 to 3 percent slopes	13	15	22	24	22	26	5	6	175	225	-----	-----
MfB2	Miles fine sandy loam, 1 to 3 percent slopes, eroded	8	10	15	17	17	19	2	3	100	150	-----	-----
MfC	Miles fine sandy loam, 3 to 5 percent slopes	10	12	17	19	19	21	-----	-----	125	175	-----	-----
MfC2	Miles fine sandy loam, 3 to 5 percent slopes, eroded	6	8	12	14	13	-----	-----	-----	25	75	-----	-----
MfD	Miles fine sandy loam, 5 to 8 percent slopes	7	9	13	15	14	-----	-----	-----	-----	-----	-----	-----
MfD2	Miles fine sandy loam, 5 to 8 percent slopes, eroded	4	6	8	10	9	-----	-----	-----	-----	-----	-----	-----
NpC	Nobscot-Pratt complex, hummocky	6	10	13	16	14	18	-----	-----	25	100	-----	-----
Po	Port silt loam	20	22	28	30	28	30	7	8	350	400	1.8	3.5
Ps	Pratt fine sandy loam, 1 to 3 percent slopes	13	16	22	24	24	28	5	6	175	225	.8	1.2
PpC	Pratt loamy fine sand, hummocky	6	8	13	15	15	18	-----	-----	-----	-----	-----	-----
PpB	Pratt loamy fine sand, undulating	9	12	16	18	16	20	3	4	100	150	.6	.8
PrB	Pratt loamy fine sand, heavy subsoil variant, undulating.	8	13	16	19	14	18	3	4	100	175	-----	-----
QwC2	Quinlan-Woodward loams, 3 to 5 percent slopes, eroded	5	8	8	10	10	12	-----	-----	-----	-----	-----	-----
SaA	St. Paul silt loam, 0 to 1 percent slopes	16	21	27	29	27	30	6	7	250	300	1.2	1.6
SaB	St. Paul silt loam, 1 to 3 percent slopes	15	18	23	25	25	27	4	6	175	250	.8	1.0
SaC	St. Paul silt loam, 3 to 5 percent slopes	12	14	19	22	16	24	2	4	100	175	-----	-----
ScC2	St. Paul clay loam, 3 to 5 percent slopes, eroded	7	10	13	15	9	15	-----	-----	50	100	-----	-----
Sp	Spur clay loam, deep water table	20	24	28	30	28	30	7	8	275	375	1.8	3.0
TpA	Tipton silt loam, 0 to 1 percent slopes	20	23	28	30	28	30	7	8	300	350	2.0	3.0
Wa	Wann soils	14	16	22	25	24	26	6	7	200	250	1.5	1.8
WbC	Woodward loam, 3 to 5 percent slopes	9	12	15	17	14	18	-----	-----	50	100	-----	-----
WcB	Woodward-Carey complex, 1 to 3 percent slopes	12	14	19	21	18	24	3	4	125	175	-----	-----
WcC2	Woodward-Carey complex, 3 to 5 percent slopes, eroded	5	8	12	14	13	15	-----	-----	25	75	-----	-----
WcD2	Woodward-Carey complex, 5 to 8 percent slopes, eroded	4	7	8	10	9	12	-----	-----	-----	-----	-----	-----
WdB	Woodward-Dill fine sandy loams, 0 to 3 percent slopes	12	14	19	21	21	23	3	4	125	175	.8	1.2
WwC	Woodward-Quinlan loams, 3 to 5 percent slopes	8	10	12	14	13	15	-----	-----	-----	-----	-----	-----
Ya	Yahola fine sandy loam, high	14	18	24	26	25	28	6	7	250	350	1.5	2.5
Yf	Yahola fine sandy loam	14	17	22	25	24	27	6	7	225	300	1.5	2.0

[1] Green weight put up as silage. [2] Field-cured weight.

Before irrigation equipment is acquired, the quantity and quality of the available water should be determined, as well as the suitability of the soil for irrigation. Preliminary plans for an irrigation system should be made, and the water rights acquired. Water rights are not acquired automatically through ownership of the land. A request must be filed with the Oklahoma Planning and Resources Board at Oklahoma City, Okla. Problems in layout, drainage, and management are different for each irrigation project. Representatives of the Soil Conservation Service or the county agricultural agent will help the farmer plan an irrigation system.

Probably the greatest potential for the development of irrigation in Dewey County is supplemental irrigation. In some years, the moisture supply is adequate for crop growth; in other years, extended droughts occur. Even

in years of high rainfall, short periods of drought often significantly reduce crop yields. By using irrigation water to supplement rainfall, damage to crops by drought could be lessened.

Range Management [5]

Soils that are best suited to permanent grass make up nearly 70 percent of the agricultural acreage of Dewey County. Included is approximately 50,000 acres of eroded land that has not yet been reseeded to grass. Most of the acreage is considered range rather than pasture because it cannot be used more profitably for purposes other than grazing.

As a whole, the rangeland of this county is producing only about half of the quantity of high-quality forage that could be produced if invading weeds and brush were controlled and if the best grasses of the original cover were reestablished (fig. 17).

***Figure 17.*—Fence line on Loamy Prairie range site showing contrast between heavy grazing on the right and moderate grazing on the left.**

The purpose of good range management is to restore, improve, and maintain the palatable, high-quality grasses in the original cover. These were the grasses that maintained themselves year after year, furnished food for wild grazing animals, and kept the soils in place. Management of range for this purpose can be approached in an orderly fashion by means of range sites, which are groups of soils similar in kind of grazing management needed, and by means of condition classes, which indicate the general quality, or condition, of the plant cover.

Soils that produce about the same kind and amount of forage, if the plant cover on all is in similar condition, make up what is called a *range site.*

The soils of any one range site, before grazing by livestock, produced about the same kind of climax vegetation. The *climax vegetation* throughout most of the prairie and the plains is the combination of plants that was growing there when the region was first settled. The most productive combination of forage plants on a range site generally is the climax type of vegetation. The climax vegetation is changed by grazing. The degree of change depends mainly on intensity of grazing. The nature of the change in plant cover is expressed by use of the terms "decreasers," "increasers," and "invaders."

[5] By Jack E. Engleman, range conservationist, Soil Conserva- Service.

Decreasers are species in the climax vegetation that tend to decrease in relative amount under close grazing. They generally are the tallest and most productive perennial grasses and forbs and are the most palatable to livestock.

Increasers are species in the climax that increase in relative amount as the more desirable plants are reduced by close grazing. They are commonly shorter, and some are less palatable to livestock than decreasers.

Invaders are plants that cannot withstand the competition for moisture, nutrients, and light in the climax vegetation. Hence, they come in and grow along with increasers after the climax vegetation has been reduced by grazing. Many are annual weeds, and some are shrubs that have some grazing value, but others have little value for grazing.

Range condition expresses the present kind and amount of vegetation in relation to the climax vegetation for a given site. Four classes are used to indicate the degree of departure from the native, or climax, vegetation brought about by grazing or other use. These classes show the present condition of the native vegetation on a range in relation to the native vegetation that could grow there.

A range is in *excellent condition* if 76 to 100 percent of the vegetation is of the same kind as the original stand. It is in *good condition* if the percentage is between 51 and 75, in *fair condition* if the percentage is between 26 and 50, and in *poor condition* if the percentage is less than 25.

Range sites

In this section, the range sites in Dewey County are described and the soils in each site are named. Also named are the grasses that are dominant if a site is in excellent condition, and the grasses that are most apt to increase or invade if the better grasses are depleted. The estimated forage production is for sites that are in excellent condition and is given both for favorable years, when rainfall is adequate, and for unfavorable years, when rainfall is limited. The estimates for forage production are in terms of air-dry weight and are based on clipping data.

SUBIRRIGATED RANGE SITE

The soils of this range site are on bottom lands along rivers. The water table fluctuates from place to place and from season to season, but it is always within reach of the roots of the best range grasses. This range site makes up about 1 percent of the acreage used for range. The soils are—

Alluvial land.
Spur clay loam, deep water table.

Switchgrass is dominant if the range is in excellent condition. Eastern gamagrass, cordgrass, Indiangrass, and common reed all occur in lesser amounts. Tall dropseed and saltgrass are common increasers. Silver bluestem is a common invader.

In favorable years, forage production is about 9,000 pounds per acre. In unfavorable years, it is about 4,500 pounds per acre.

SANDY BOTTOM LAND RANGE SITE

The sandy soils of this range site are on the bottom lands of rivers and large creeks. At times they are left scoured or hummocky by floodwaters, especially in the areas near the stream channel. In some small areas, the water table is near the surface, but in most places it is well below the surface. This site makes up about 3 percent of the acreage used for range. The soils are—

Brazos loamy fine sand.
Lincoln soils.

Sand bluestem and little bluestem are dominant if the range is in excellent condition. Switchgrass, sand lovegrass, and Indiangrass occur in lesser amounts. Sand dropseed, sand paspalum, silver bluestem, and weeds become dominant if the more desirable grasses decrease under continuous heavy grazing.

In favorable years, forage production is about 5,500 pounds per acre. In unfavorable years, it is about 2,500 pounds per acre.

LOAMY BOTTOM LAND RANGE SITE

Deep, loamy soils on bottom lands make up this site. Most of the acreage is cultivated. Runoff from higher areas furnishes some moisture. This site occupies about 2 percent of the acreage used for range. The soils are—

Canadian loam.
Port silt loam.
Wann soils.
Yahola fine sandy loam.
Yahola fine sandy loam, high.

Sand bluestem, big bluestem, little bluestem, switchgrass, and Indiangrass are dominant if the range is in excellent condition. Side-oats grama, vine-mesquite, and western wheatgrass are the common increasers. Invading plants include silver bluestem, western ragweed, and sand dropseed.

In favorable years, forage production is about 5,200 pounds per acre. In unfavorable years, it is about 2,200 pounds per acre.

DEEP SAND RANGE SITE

In this site are deep, nearly level to steeply sloping soils on uplands (fig. 18). These soils contain little silt or clay.

Figure 18.—**Deep Sand range site infested with sand sagebrush.**

The intake of water is rapid, and there is little runoff. Consequently, few drainageways have formed. This site makes up about 5 percent of the acreage used for range. The soils are—

Pratt loamy fine sand, hummocky.
Pratt loamy fine sand, undulating.
Pratt-Tivoli loamy fine sands.
Tivoli fine sand.

Only the less strongly sloping areas of Tivoli fine sand are in this site. The steeper areas are in the Dune range site.

Small amounts of sand sagebrush and skunkbush are normal on the Deep Sand range site, but sand bluestem and little bluestem are dominant if the range is in excellent condition. Brush and big sandreed are the common increasers. Sand dropseed is the common invader.

In favorable years, forage production is about 4,000 pounds per acre. In unfavorable years, it is about 2,000 pounds per acre.

DEEP SAND SAVANNAH RANGE SITE

The deep, gently sloping to steep sandy soils in this range site are underlain by clay. These soils absorb water readily. They retain much of the moisture in the upper part of the profile because of the tight, underlying layer of clay. This site makes up about 10 percent of the acreage used for range. The soils are—

Nobscot fine sand, rolling.
Nobscot-Pratt complex, hummocky.
Pratt loamy fine sand, heavy subsoil variant, undulating.

Little bluestem and sand bluestem provide the bulk of the forage on this site if the range is in excellent condition. Normally, however, there is some scattered blackjack oak and shinnery oak in the cover. Oak and sand paspalum are the principal increasers. Red lovegrass and western ragweed are the common invaders.

In favorable years, forage production is about 4,200 pounds per acre. In unfavorable years, it is about 1,750 pounds per acre.

SANDY PRAIRIE RANGE SITE

The deep, moderately sandy soils in this range site absorb water readily if properly managed. This site makes up about 17 percent of the acreage used for range. The soils are—

Broken land.
Carwile-Pratt complex.
Dill fine sandy loam, 1 to 5 percent slopes.
Dill fine sandy loam, 3 to 8 percent slopes, eroded.
Dill fine sandy loam, 5 to 8 percent slopes.
Enterprise fine sandy loam, 0 to 3 percent slopes.
Enterprise fine sandy loam, 3 to 5 percent slopes.
Enterprise fine sandy loam, 5 to 8 percent slopes.
Enterprise fine sandy loam, 8 to 20 percent slopes.
Farnum fine sandy loam, 0 to 1 percent slopes.
Miles fine sandy loam, 0 to 1 percent slopes.
Miles fine sandy loam, 1 to 3 percent slopes.
Miles fine sandy loam, 1 to 3 percent slopes, eroded.
Miles fine sandy loam, 3 to 5 percent slopes.
Miles fine sandy loam, 3 to 5 percent slopes, eroded.
Miles fine sandy loam, 5 to 8 percent slopes.
Miles fine sandy loam, 5 to 8 percent slopes, eroded.
Pratt fine sandy loam, 1 to 3 percent slopes.
Quinlan-Enterprise complex (Enterprise soil only).
Woodward-Dill fine sandy loams, 0 to 3 percent slopes.

The vegetative cover is dominated by sand bluestem and little bluestem if the range is in excellent condition. In-

creasers include side-oats grama, blue grama, and tall dropseed. Invaders include sand dropseed, western ragweed, and sand sagebrush.

In favorable years, forage production is 4,500 pounds per acre. In unfavorable years, it is 2,000 pounds per acre.

LOAMY PRAIRIE RANGE SITE

Deep, medium-textured soils of the uplands make up this range site. These soils absorb water readily if a mulch is kept on the surface. Most of the acreage is cultivated. The small areas remaining in native vegetation generally are associated with the shallower soils of the Shallow Prairie range site. This site accounts for about 17 percent of the acreage in the county that is used for range. The soils are—

Carey silt loam, 1 to 3 percent slopes.
Carey silt loam, 3 to 5 percent slopes.
Carey silt loam, 5 to 8 percent slopes.
Enterprise very fine sandy loam, 0 to 1 percent slopes.
Enterprise very fine sandy loam, 1 to 3 percent slopes.
Holdrege silt loam, 0 to 1 percent slopes.
Holdrege silt loam, 1 to 3 percent slopes.
Quinlan-Woodward loams, 5 to 20 percent slopes (Woodward soil only).
Quinlan-Woodward loams, 3 to 5 percent slopes, eroded (Woodward soil only).
Tipton silt loam, 0 to 1 percent slopes.
Woodward loam, 3 to 5 percent slopes.
Woodward-Carey complex, 1 to 3 percent slopes.
Woodward-Carey complex, 3 to 5 percent slopes, eroded.
Woodward-Carey complex, 5 to 8 percent slopes, eroded.
Woodward-Quinlan loams, 3 to 5 percent slopes (Woodward soil only).

If in excellent condition, this site supports a cover of sand bluestem or big bluestem, little bluestem, switchgrass, and side-oats grama. Heavy grazing results in an increase in side-oats grama and blue grama. If heavy grazing is continued, there is a considerable increase in western ragweed, blue grama, buffalograss, and sand dropseed.

In favorable years, forage production is about 4,200 pounds per acre. In unfavorable years, it is about 1,800 pounds per acre.

HARD LAND RANGE SITE

This range site consists of deep, fine-textured soils on level to moderately sloping uplands. It makes up about 3 percent of the acreage used for range. Nearly all of the acreage is cultivated. The soils are—

Lofton clay loam.
St. Paul clay loam, 3 to 5 percent slopes, eroded.
St. Paul silt loam, 0 to 1 percent slopes.
St. Paul silt loam, 1 to 3 percent slopes.
St. Paul silt loam, 3 to 5 percent slopes.

Generally, this site is considered a short-grass range. The cover consists mostly of buffalograss, blue grama, and weeds. If the range is in excellent condition, the cover contains a considerable amount of bluestem, switchgrass, and side-oats grama. Heavy grazing causes the more desirable grasses to decrease rapidly. Compaction makes the soils droughty. Side-oats grama, blue grama, and buffalograss are the principal increasers. Silver bluestem and western ragweed are the common invaders.

In favorable years, forage production is about 3,500 pounds per acre. In unfavorable years, it is about 1,300 pounds per acre.

RED CLAY PRAIRIE RANGE SITE

This range site consists of only the moderately deep part of the Vernon complex. These fine-textured soils occur on the uplands, mainly in the southwestern part of the county. This site makes up less than 1 percent of the acreage used for range.

Where the range is in excellent condition, sand bluestem is dominant, but side-oats grama, little bluestem, and switchgrass make up a considerable part of the cover. Blue grama, side-oats grama, and buffalograss are the most important increasers. Silver bluestem, western ragweed, and windmillgrass are the common invaders.

In favorable years, forage production is about 3,300 pounds per acre. In unfavorable years, it is about 1,000 pounds per acre.

SHALLOW PRAIRIE RANGE SITE

In this range site are shallow, medium-textured, gently sloping to steep soils, a few barren slopes, and some soils on the bottom of draws less than 150 feet wide. This site makes up more than a third of the acreage used for range. The soils are—

Quinlan loam.
Quinlan-Enterprise complex (Quinlan soil only).
Quinlan-Woodward loams, 3 to 5 percent slopes, eroded (Quinlan soil only).
Quinlan-Woodward loams, 5 to 20 percent slopes (Quinlan soil only).
Woodward-Quinlan loams, 3 to 5 percent slopes (Quinlan soil only).

Little bluestem makes up most of the cover if the range is in excellent condition. Under heavy grazing, side-oats grama and blue grama increase. If heavy grazing is continued, sand dropseed and western ragweed invade.

In favorable years, forage production is about 3,300 pounds per acre. In unfavorable years, it is about 900 pounds per acre.

ERODED SANDY LAND RANGE SITE

Eroded sandy land is the only mapping unit in this range site. It consists of badly gullied uplands and areas that have been severely damaged by sheet erosion. It makes up about 1 percent of the acreage in range.

This site is not suited to short grasses. The growth of taller grasses, such as little bluestem, switchgrass, sand bluestem, and Indiangrass, should be encouraged. Seeding may be necessary in some places. Sand paspalum is an important increaser. Red lovegrass is a common invader.

In favorable years, forage production is about 3,000 pounds per acre. In unfavorable years, it is about 1,500 pounds per acre.

ERODED PRAIRIE RANGE SITE

In this range site are moderately shallow, medium-textured and fine-textured soils on gently sloping to steep uplands. Because of severe sheet and gully erosion, these soils are no longer cultivated. They make up about 3 percent of the acreage in range. The soils are—

Quinlan soils, severely eroded.
Vernon soils, severely eroded.

Side-oats grama is best suited to this site, but little bluestem and blue grama should also be used in revegetating. Silver bluestem is a common invader.

In favorable years, forage production is about 2,200 pounds per acre. In unfavorable years, it is about 700 pounds per acre.

DUNE RANGE SITE

This site consists of the steeper parts of Tivoli fine sand. It makes up less than 1 percent of the acreage in range. The less strongly sloping areas of Tivoli fine sand are in the Deep Sand range site.

Even if the range is in excellent condition, woody plants, particularly brush, make up a considerable part of the cover, but the dominant vegetation is sand bluestem, sand lovegrass, little bluestem, and big sandreed. The principal increasers are sand paspalum and sand dropseed.

Grazing should be carefully controlled on this site. Trampling of the steep, loose sandy soil will cause considerable damage, and overgrazing will destroy much of the vegetative cover.

In favorable years, forage production is about 1,600 pounds per acre. In unfavorable years, it is about 800 pounds per acre.

BREAKS RANGE SITE

The Breaks range site is made up entirely of Rough broken land. This land type is on the steeply sloping uplands and includes deep and steep-walled canyons that impede the movement of livestock. Generally, there is only a thin covering of soil material, but there are scattered pockets of deeper soils. This site makes up less than 1 percent of the acreage in range.

Little bluestem and sand bluestem are dominant if the range is in excellent condition. Side-oats grama is the principal increaser. Invading plants include sand dropseed and western ragweed.

In favorable years, forage production is about 1,800 pounds per acre. In unfavorable years, it is about 1,000 pounds per acre.

RED SHALE RANGE SITE

The Red Shale range site consists of the very shallow soils in the Vernon complex. It is in the southwestern part of the county. The soils are strongly sloping to very steep and are droughty. Red shale is exposed in many places, and sandstone knobs are common. This site makes up less than 1 percent of the acreage in range.

Side-oats grama, sand bluestem, and little bluestem make up most of the vegetative cover if the range is in excellent condition. Blue grama and buffalograss are the increasers. Hairy tridens is a common invader.

In favorable years, forage production is about 1,800 pounds per acre. In unfavorable years, it is about 400 pounds per acre.

Management practices

Following are some of the main practices needed to encourage the growth of the best native forage plants.

Control of grazing.—Without control of grazing, all other practices will fail. In their green leaves, grasses manufacture the food they need to grow, flower, and reproduce. If too much of this green foliage is removed by grazing or mowing, the plant is weakened and stunted.

Experience has shown that when only about half the yearly volume of grass produced is grazed, damage to the better plants is kept to a minimum and the range will improve.

Local agricultural agencies have technical personnel who can assist in classifying range according to site and condition class. They can offer suggestions on changes in present grazing practices or suggest a starting rate of grazing. The operator who becomes familiar with his range sites and understands signs of improvement or continued decline can manage these sites to favor the best forage plants in each.

Distribution of grazing.—To obtain an even distribution of grazing is a problem in some areas, especially if soils of two or more range sites are included. Fencing each site is desirable, but the cost and the returns expected must be considered. Placing salt or water in selected spots may help to distribute grazing.

Deferred grazing.—Rest in spring and in summer is an excellent way to hasten recovery of range that is in poor or fair condition. This practice should not be used if it necessitates the overgrazing of other areas. Cropland can be used for temporary pasture to permit deferred grazing.

Control of weeds and brush.—Weeds and brush can be controlled by the use of chemicals, by mechanical means, or through natural succession. The use of herbicides to control shinnery oak, sand sagebrush, or other woody species is becoming more common and is an excellent practice to increase forage production (figs. 19, 20, 21). To permit the recovery of the better grasses, areas that have been treated for removal or control of brush should not be grazed during the next growing season. Light grazing in winter may help to distribute seed. Generally, woody plants should not be removed from sand dunes, where any kind of cover helps to prevent soil from drifting.

Range seeding.—In seeding areas no longer suited to cultivation or in reseeding areas that are in poor condition, the seed mixture should be determined by the range site. Generally, climax grasses should make up most of the grass mixture. Normally, sandy soils will support a cover of mid and tall grasses because they are permeable to water and lose little water through runoff. Clayey soils are better suited to a mixture of short, mid, and tall grasses because, in this area of limited rainfall, they tend to be droughty.

To establish a grass cover on soils protected by sorghum stubble, it is best to use an especially designed grass-seed drill. Soils infested with sandburs and crabgrass should be cleared before grass is seeded. Range that is in poor condition can be reseeded with a grass drill or with a furrow-type overseeding drill if one is available. Generally, no other land preparation is needed. Seeded fields should be fenced until a good stand is established.

Woodland and Windbreaks [6]

Although there are some 38,000 acres of native woodland in the county, relatively little of the timber can be classed as marketable. The post-blackjack oak area in the eastern part of the county has been reduced largely to a stand of scrub blackjack oak through intensive and unmanaged cutting. Portable sawmills operate at intervals in areas where cottonwood, elm, bur oak, and hackberry

[6] By HERBERT R. WELLS, soil conservationist, Soil Conservation Service.

Figure 19.—Deep Sand Savannah range site showing usual infestation of oak.

Figure 20.—Deep Sand Savannah range site showing improvement through a program of chemical spraying and deferment of grazing. (See fig. 19.)

Figure 21.—Deep Sand Savannah range site. Cleared of oak and seeded in 1956, sprayed in 1958, and now nearing excellent condition. (See figs. 19 and 20.)

grow along streams. Redcedar is used locally for fence posts.

Table 7 shows the suitability of the soils for field windbreaks, farmstead windbreaks, and post lots. Some soils are limited in suitability because of shallowness or other unfavorable profile characteristics. Others are limited because plantings would require extra tillage, extra water, or very wide spacing.

TABLE 7.—*Suitability of soils for field and farmstead windbreaks and post lot plantings*

Soil	Field windbreak	Farmstead windbreak	Post lot
Alluvial land	Suitable with limitations.	Suitable with limitations.	Suitable with limitations.
Brazos loamy fine sand	Suitable with limitations.	Suitable	Suitable with limitations.
Broken land	Not suitable.	Suitable with limitations.	Not suitable.
Canadian loam	Suitable	Suitable	Suitable.
Carey silt loam, 1 to 3 percent slopes.	Suitable with limitations.	Suitable	Not suitable.
Carey silt loam, 3 to 5 percent slopes.	Not suitable.	Suitable with limitations.	Not suitable.
Carey silt loam, 5 to 8 percent slopes.	Not suitable.	Not suitable.	Not suitable.
Carwile-Pratt complex	Suitable with limitations.	Suitable	Suitable with limitations.
Dill fine sandy loam, 1 to 5 percent slopes.	Suitable with limitations.	Suitable	Not suitable.
Dill fine sandy loam, 3 to 8 percent slopes, eroded.	Not suitable.	Suitable with limitations.	Not suitable.
Dill fine sandy loam, 5 to 8 percent slopes.	Not suitable.	Suitable with limitations.	Not suitable.
Enterprise fine sandy loam, 0 to 3 percent slopes.	Suitable	Suitable	Suitable.
Enterprise fine sandy loam, 3 to 5 percent slopes.	Suitable with limitations.	Suitable	Not suitable.
Enterprise fine sandy loam, 5 to 8 percent slopes.	Not suitable.	Suitable with limitations.	Not suitable.
Enterprise fine sandy loam, 8 to 20 percent slopes.	Not suitable.	Suitable with limitations.	Not suitable.
Enterprise very fine sandy loam, 0 to 1 percent slopes.	Suitable with limitations.	Suitable	Suitable with limitations.
Enterprise very fine sandy loam, 1 to 3 percent slopes.	Suitable with limitations.	Suitable	Suitable with limitations.
Eroded sandy land	Not suitable.	Suitable with limitations.	Not suitable.
Farnum fine sandy loam, 0 to 1 percent slopes.	Suitable with limitations.	Suitable	Suitable with limitations.
Holdrege silt loam, 0 to 1 percent slopes.	Suitable	Suitable	Suitable.
Holdrege silt loam, 1 to 3 percent slopes.	Suitable	Suitable	Suitable.

TABLE 7.—*Suitability of soils for field and farmstead windbreaks and post lot plantings*—Continued

Soil	Field windbreak	Farmstead windbreak	Post lot
Lincoln soils	Suitable with limitations.	Suitable with limitations.	Suitable with limitations.
Lofton clay loam	Not suitable.	Suitable with limitations.	Not suitable.
Miles fine sandy loam, 0 to 1 percent slopes.	Suitable with limitations.	Suitable	Suitable with limitations.
Miles fine sandy loam, 1 to 3 percent slopes.	Suitable with limitations.	Suitable	Suitable with limitations.
Miles fine sandy loam, 1 to 3 percent slopes, eroded.	Suitable with limitations.	Suitable	Suitable with limitations.
Miles fine sandy loam, 3 to 5 percent slopes.	Suitable with limitations.	Suitable	Suitable with limitations.
Miles fine sandy loam, 3 to 5 percent slopes, eroded.	Suitable with limitations.	Suitable	Suitable with limitations.
Miles fine sandy loam, 5 to 8 percent slopes.	Not suitable.	Suitable with limitations.	Not suitable.
Miles fine sandy loam, 5 to 8 percent slopes, eroded.	Not suitable.	Suitable with limitations.	Not suitable.
Nobscot fine sand, rolling.	Not suitable.	Not suitable.	Not suitable.
Nobscot-Pratt complex, hummocky.	Suitable with limitations.	Suitable	Not suitable.
Port silt loam	Suitable	Suitable	Suitable.
Pratt fine sandy loam, 1 to 3 percent slopes.	Suitable with limitations.	Suitable	Suitable with limitations.
Pratt loamy fine sand, heavy subsoil variant, undulating.	Suitable	Suitable	Suitable.
Pratt loamy fine sand, hummocky.	Not suitable.	Suitable with limitations.	Not suitable.
Pratt loamy fine sand, undulating.	Suitable with limitations.	Suitable	Suitable with limitations.
Pratt-Tivoli loamy fine sands.	Not suitable.	Suitable with limitations.	Not suitable.
Quinlan loam	Not suitable.	Not suitable.	Not suitable.
Quinlan soils, severely eroded.	Not suitable.	Not suitable.	Not suitable.
Quinlan-Enterprise complex.	Not suitable.	Not suitable.	Not suitable.
Quinlan-Woodward loams, 3 to 5 percent slopes, eroded.	Not suitable.	Not suitable.	Not suitable.
Quinlan-Woodward loams, 5 to 20 percent slopes.	Not suitable.	Not suitable.	Not suitable.
Rough broken land	Not suitable.	Not suitable.	Not suitable.
St. Paul silt loam, 0 to 1 percent slopes.	Suitable with limitations.	Suitable	Not suitable.
St. Paul silt loam, 1 to 3 percent slopes.	Suitable with limitations.	Suitable	Not suitable.
St. Paul silt loam, 3 to 5 percent slopes.	Not suitable.	Suitable with limitations.	Not suitable.
St. Paul clay loam, 3 to 5 percent slopes, eroded.	Not suitable.	Suitable with limitations.	Not suitable.
Spur clay loam, deep water table.	Suitable	Suitable	Suitable.
Tipton silt loam, 0 to 1 percent slopes.	Suitable	Suitable	Suitable.
Tivoli fine sand	Not suitable.	Not suitable.	Not suitable.
Vernon soils, severely eroded.	Not suitable.	Not suitable.	Not suitable.
Vernon complex	Not suitable.	Not suitable.	Not suitable.
Wann soils	Suitable	Suitable	Suitable.
Woodward loam, 3 to 5 percent slopes.	Not suitable.	Suitable with limitations.	Not suitable.
Woodward-Carey complex, 1 to 3 percent slopes.	Suitable with limitations.	Suitable	Not suitable.
Woodward-Carey complex, 3 to 5 percent slopes, eroded.	Not suitable.	Suitable with limitations.	Not suitable.
Woodward-Carey complex, 5 to 8 percent slopes, eroded.	Not suitable.	Not suitable.	Not suitable.
Woodward-Dill fine sandy loams, 0 to 3 percent slopes.	Suitable with limitations.	Suitable with limitations.	Suitable with limitations.
Woodward-Quinlan loams, 3 to 5 percent slopes.	Not suitable.	Not suitable.	Not suitable.
Yahola fine sandy loam, high.	Suitable	Suitable	Suitable.
Yahola fine sandy loam.	Suitable with limitations.	Suitable	Suitable.

Farmstead windbreaks can be grown in most areas where farm homes are established. Suitable species that are easily obtained are redcedar, Siberian elm, Chinese elm, cottonwood, sycamore, Russian mulberry, catalpa, and the nonornamental arborvitae. These can be supplemented with ornamental trees and shrubs.

More than 100 miles of field windbreaks have been planted in the county. Although many of these plantings failed, mainly because the soils were not suitable, those that were successful demonstrated the effectiveness of windbreaks in protecting crops and in controlling erosion.

These narrow field plantings, or belts, occupy relatively little cropland, and if cultivated regularly and protected from damage by livestock, they will reduce wind velocities significantly.

Field windbreaks provide the greatest benefits only if they are placed at determined intervals around and across the fields or areas to be protected. Generally, the maximum distance between the belts should not exceed 20 times the anticipated eventual height of the tallest trees in the belt. Windbreaks planted at this maximum distance will need to be supplemented by other erosion control practices.

Except for catalpa and ornamental shrubs, the species suggested for farmstead windbreaks are also suitable for field windbreaks. However, in farmstead windbreaks, up to seven rows of trees and shrubs are often used, whereas in field windbreaks, only three rows are needed. The first row should consist of shrubs and should be on the windward side. The other two rows should consist of tall trees. Elm, cottonwood, and sycamore give the greatest range of protection. As the tall trees gradually shed their lower branches, mulberry, spaced 4 feet apart, or redcedar will provide good protection at ground level.

Because of the shortage of moisture, relatively wide spacing is needed both between the rows and between the trees within the row. On the uplands, the minimum spacing needed for trees planted in areas that are not irrigated depends on the depth of the permeable soil. If the depth of the permeable soil is 4 feet, then the rows should be 18 feet apart, and the trees within each row should be at intervals of 8 feet; if the depth of the permeable soil is 5 feet, then the rows should be 14 feet apart, and the trees within each row should be at intervals of 8 feet; if the depth of the permeable soil is 6 feet, then the rows should be 12 feet apart, and the trees within each row at intervals of 8 feet. The position of the trees should be staggered from row to row.

Normally, shrubs are spaced 4 feet apart, regardless of the depth of the permeable soil, and the distance between the rows is the same as that given for trees. The spacing between trees may be reduced if there is a corresponding increase in the distance between rows. If runoff is diverted to the windbreak or if the area is irrigated, the width between the rows may be reduced to 10 feet, regardless of the depth of the permeable soil, provided, of course, that the equipment used for cultivating can be accommodated in this 10-foot space.

Odd areas, not suitable for crops, generally are used for post lots. The species most commonly grown are black locust, catalpa, and bois d'arc. The minimum spacing is 6 feet within rows and 10 feet between rows if the soils are permeable to a depth of at least 5 feet. For maximum growth, cultivation is essential until the branches interlock between the rows.

The number of successful orchards in the county indicates possibilities of a more extensive production of both fruit and berries on some of the more sandy soils. However, there would still be a problem of erosion control, since the shortage of rainfall somewhat limits the use of cover crops, and clean cultivation creates an erosion hazard. This problem might be overcome by establishing windbreaks around orchards, or even through large orchards.

Wildlife

The birds in the county include bobwhite quail, doves, prairie chickens, wild turkeys, ringnecked pheasants, some eastern and western small birds, and a few hawks and owls. The common mammals are jackrabbits, cottontail rabbits, skunks, opossums, red squirrels, raccoons, and coyotes. Less common are mink, muskrats, and bobcats. A remnant population of whitetail deer is found in scattered favorable habitats along the rivers. Early writings identified elk and cougar in the general area of the county. Bison and antelope have been described as existing in large numbers.

Quail, the most important game species in the county, have prospered because of the invasion of weeds in the grassland, and because of the cultivation of small fields in the more sandy areas. The quail population is seldom stable for more than a few years at a time. In droughty years and in years when snow covers the ground for long periods, the number is reduced. Rains of high intensity and occasional floods also cause serious losses.

Although mourning doves have become more plentiful, they also fluctuate in number. Their abundance during the hunting season is influenced partly by the migration of northern birds into the county. The extensive planting of trees and shrubs around farmsteads and in field windbreaks has contributed somewhat to their increase. Red squirrels have also responded to this artificial extension of trees throughout the county. Wild turkeys have recently increased in number where there are suitable trees, food, and water. At present, there is an upward trend in the number of prairie chickens. This may be attributed to the improvement of the range and the conversion of much cropland to grassland, but it is not likely that the number of prairie chickens will ever be sufficient to justify more than short, infrequent open seasons. Sporadic attempts to introduce ringnecked pheasants have generally proven unsuccessful.

Opportunities for duck and goose shooting are relatively limited and are unpredictable from year to year. Except for small areas near the Canton Reservoir, in the northeastern part of the county, and near the detention structures on Barnitz Creek, in the southwestern part, hunting centers around farm ponds and along the North Canadian and South Canadian Rivers. There is some field and pass shooting in the vicinity of the larger impoundments.

A fair amount of fishing is provided by the flood prevention structures, the Canton Reservoir, and the numerous farm ponds. Most of the smaller impoundments have been stocked with black bass, bluegill, and channel catfish. Under good management, including fertilizing, control of aquatic weeds, and heavy use, yields could be excellent. The Canton Reservoir provides good fishing for white bass, crappie, flathead catfish, carp, gar, and a variety of sunfish. The stocking of pike is currently being considered.

The protection of natural habitats from fire, overgrazing, and indiscriminate brush control is needed to maintain the wildlife population. Quail respond markedly to the improvement or extension of natural areas. Their natural habitats can be increased by fencing to control overgrazing and to encourage the growth of native vegetation; by planting additional food crops or cover plants;

and by disking field borders to encourage the growth of weeds. The extensive sandy areas that are covered with post oak and blackjack oak would be more productive of game if the growth were thinned, either by spraying or by mechanical means, to stimulate the production of mast and to provide woodland border areas.

Natural nesting places for waterfowl are limited. To attract and hold a greater number of fall and winter migrants would require better management of impoundments. Such a program would have to be on an area-wide basis. Plans for the general improvement of water areas for wild fowl would have to include protected resting and feeding places. Except for the area in the vicinity of the Canton Reservoir, the birds are rapidly burned out by intensive hunting when flights occur.

Engineering Properties of the Soils[7]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. The properties most important to the engineer are permeability to water, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and pH-value. Depth to the water table, depth to bedrock, and topography are also important.

The information in this report can be used to—

1. Make soil and land use studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils that are significant in the planning of agricultural drainage, irrigation systems, farm ponds, and terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway, airport, pipeline, and cable locations and in planning detailed investigations at selected locations.
4. Locate probable sources of road and highway construction materials.
5. Correlate performance of engineering structures with soils, and thus gain information that will be useful in designing and maintaining the structures.
6. Determine the suitability of soil units for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs for the purpose of making maps and reports that can be readily used by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

This report and soil map do not eliminate the need for sampling and testing soils at the site chosen for construction. The mapping and the descriptions of the soils are somewhat generalized and, therefore, are not a substitute for detailed engineering surveys at a particular site.

Some terms used by the agricultural soil scientist may be unfamiliar to the engineer, and some commonly used terms have a special meaning in soil science. These terms are defined in the Glossary at the end of this report.

Engineering soil classification, interpretations, and soil test data

Tables 8, 9, and 10 summarize the physical and chemical properties and the suitability of the soils for engineering construction.

Three different systems are used to classify the soils: (1) the U.S. Department of Agriculture (USDA) textural classification, (2) the American Association of State Highway Officials (AASHO) classification,[8] and (3) the Unified classification developed by the Corps of Engineers, U.S. Army.[9]

The AASHO system is used by highway engineers to classify soils according to their engineering properties as determined by the performance of the soils in highways. In this system, soils are placed in seven principal groups. The groups range from A-1, consisting of gravelly soils of high bearing capacity, to A-7, consisting of clay soils that have low strength when wet. Within each group, the relative engineering value of the soil material may be indicated by a group index number. Group indexes range from 0 for the best material to 20 for the poorest. The group index number is shown in parentheses following the soil group symbol in the next to last column in table 10.

In the Unified classification, the soils are grouped on the basis of their texture and plasticity and their performance as material for engineering structures. Soil materials are identified as coarse-grained soils, which are gravels (G) and sands (S); fine-grained soils, which are silts (M) and clays (C); and highly organic soils (Pt). In this system, SW and SP are clean sands; SM and SC are sands that include fines of silt and clay; ML and CL are silts and clays that have a low liquid limit; and MH and CH are silts and clays that have a high liquid limit.

Table 8 briefly describes the soils in Dewey County and lists their estimated physical and chemical properties. The properties are based on a typical profile for each soil mapped. The information in table 8 is based on test data, if such data are available. Estimates are given if no test data are available. These estimates are based on tests of similar soils in this county, on test data obtained from the same soils in other counties, and on past experience in engineering construction. Since the estimates are only for modal soils, considerable variations from these values should be anticipated. More information on the range of properties of the soils can be obtained in other sections of the report. The thickness of each horizon sampled is shown in the column headed "Depth from surface." More complete profile descriptions are in the section "Genesis, Morphology, and Classification of Soils."

The soils listed in table 8 have been placed in four hydrologic soil groups, according to the classification de-

[7] This section was prepared with the assistance of ROBERT L. BARTHOLIC and BOB G. DAY, agricultural engineers, Soil Conservation Service.

[8] AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 8, 2 parts, illus. Washington, D.C. 1961.

[9] WATERWAYS EXPERIMENT STATION. THE UNIFIED SOIL CLASSIFICATION SYSTEM. Tech. Memo. No. 3-357, 48 p., illus. Prepared for Off. of Engin., Vicksburg, Miss. 1953.

TABLE 8.—*Brief description of soils of Dewey County, Okla., and*

Map symbol	Soil	Brief description of site and soil	Hydrologic soil group	Depth from surface
				Inches
Ad	Alluvial land.	Bottom lands; poorly drained soils; loamy surface layer; subsoil is river sand; water table at about 3 feet.	B.	0 to 22 22 to 72
Bf	Brazos loamy fine sand.	Sandy bottom lands; well-drained soils, underlain by stratified silt and sand.	A.	0 to 40 40 to 65
Br	Broken land.	Mixed sandy land on very steep slopes; well drained.	B.	0 to 48
Ca	Canadian loam.	Bottom lands; well-drained, level soils.	B.	0 to 29 29 to 60
CeB CeC CeD	Carey silt loam, 1 to 3 percent slopes. Carey silt loam, 3 to 5 percent slopes. Carey silt loam, 5 to 8 percent slopes.	Uplands; well-drained soils, underlain by soft sandstone at a depth of 4 to 5 feet.	B.	0 to 20 20 to 50 50+
Cp	Carwile-Pratt complex.	Carwile soils in depressed areas on uplands; moderately sandy surface layer; compact, clayey subsoil. See data for Pratt soils. Water impounded during wet seasons.	C.	0 to 14 14 to 48 48 to 54
DfC DfD DfD2	Dill fine sandy loam, 1 to 5 percent slopes. Dill fine sandy loam, 5 to 8 percent slopes. Dill fine sandy loam, 3 to 8 percent slopes.	Convex slopes on uplands; well-drained, sandy soils, underlain by packsand at a depth of 3 to 4 feet.	B.	0 to 42 42+
EfB EfC EfD EfE	Enterprise fine sandy loam, 0 to 3 percent slopes. Enterprise fine sandy loam, 3 to 5 percent slopes. Enterprise fine sandy loam, 5 to 8 percent slopes. Enterprise fine sandy loam, 8 to 20 percent slopes.	Uplands; well-drained, level to strongly sloping soils.	B.	0 to 26 26 to 72
EnA EnB	Enterprise very fine sandy loam, 0 to 1 percent slopes. Enterprise very fine sandy loam, 1 to 3 percent slopes.	Terraces; well-drained, level to gently sloping soils.	B.	0 to 26 26 to 60
Er	Eroded sandy land.	Sandy uplands; eroded, well-drained, sandy soils.	B.	0 to 60
FaA	Farnum fine sandy loam, 0 to 1 percent slopes.	Broad upland flats; deep, nearly level soils; moderately sandy surface layer; clayey subsoil.	C.	0 to 20 20 to 60 60+
HoA HoB	Holdrege silt loam, 0 to 1 percent slopes. Holdrege silt loam, 1 to 3 percent slopes.	Old river terraces; well-drained, nearly level soils.	B.	0 to 20 20 to 52 52 to 72
Ln	Lincoln soils.	Bottom lands; deep, very sandy soils, near stream channels; subject to frequent flooding.	A.	0 to 4 4 to 60
Lo	Lofton clay loam.	Depressed areas on uplands; poorly drained, clayey soils.	C.	0 to 6 6 to 42
MfA MfB MfB2 MfC MfC2 MfD MfD2	Miles fine sandy loam, 0 to 1 percent slopes. Miles fine sandy loam, 1 to 3 percent slopes. Miles fine sandy loam, 1 to 3 percent slopes, eroded. Miles fine sandy loam, 3 to 5 percent slopes. Miles fine sandy loam, 3 to 5 percent slopes, eroded. Miles fine sandy loam, 5 to 8 percent slopes. Miles fine sandy loam, 5 to 8 percent slopes, eroded.	Uplands; well-drained, level to gently sloping soils.	B.	0 to 8 8 to 46 46 to 75

their estimated physical and chemical properties

Classification			Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4	No. 10	No. 200				
						Inches per hour	*Inches per inch of soil*	*pH value*	
Silty clay loam	CL or CH	A–7	100	100	85 to 95	0.05 to 0.2	0.18	7.2 to 7.7	Moderate.
Loamy fine sand	SM	A–2, A–4	100	90 to 100	30 to 40	5 to 10	.10	7.0 to 7.5	Low.
Loamy fine sand	SM	A–2	100	100	15 to 35	2.5 to 5	.07	6.8 to 7.2	Low.
Fine sand	SP, SM	A–2	100	100	5 to 20	5 to 10	.07	7.0 to 7.5	Low.
Sandy clay loam	SC	A–2, A–6	100	90 to 100	30 to 40	0.8 to 2.5	.15	7.2 to 7.7	Low to moderate.
Loam	ML–CL	A–6	100	100	85 to 95	0.8 to 2.5	.15	6.8 to 7.2	Low to moderate.
Loam	ML–CL	A–6	100	100	85 to 95	0.8 to 2.5	.15	7.0 to 7.5	Low to moderate.
Silt loam	ML–CL	A–4	100	100	65 to 75	0.2 to 0.8	.14	6.7 to 7.0	Low.
Clay loam	ML–CL	A–4	100	100	65 to 75	0.2 to 0.8	.14	6.8 to 7.3	Low.
Loam	SM	A–4	100	100	40 to 50	0.2 to 0.8	.12	7.0 to 7.5	Low.
Fine sandy loam	SM	A–2, A–4	100	100	30 to 40	2.5 to 5	.10	6.5 to 7.0	Low.
Sandy clay	SC	A–6	100	100	40 to 50	0.05 to 0.2	.18	6.3 to 6.8	Moderate.
Clay loam	SC or CL	A–6	100	100	45 to 55	0.05 to 0.2	.18	6.5 to 7.0	Moderate.
Fine sandy loam	SM	A–4	100	100	40 to 50	2.5 to 5	.12	6.5 to 7.0	Low.
Sandy loam	SM	A–2	100	100	20 to 35	2.5 to 5	.12	6.5 to 7.0	Low.
Fine sandy loam	SM–SC	A–4	100	100	40 to 50	0.8 to 2.5	.12	7.0 to 7.5	Low.
Fine sandy loam	SM–SC	A–2	100	100	20 to 35	0.8 to 2.5	.12	7.5 to 8.0	Low.
Very fine sandy loam.	ML–CL	A–4	100	100	60 to 70	0.8 to 2.5	.14	7.0 to 7.5	Low.
Very fine sandy loam.	SM–SC	A–2	100	100	25 to 35	0.8 to 2.5	.14	7.5 to 8.0	Low.
Loamy fine sand to fine sandy loam.	SM	A–2	100	100	15 to 30	0.8 to 5	.12	6.0 to 8.0	Low.
Fine sandy loam	SM	A–4	100	100	35 to 45	0.8 to 2.5	.12	6.5 to 7.0	Low.
Clay loam	CL	A–6	100	100	80 to 90	0.2 to 0.8	.18	6.8 to 7.3	Moderate.
Clay loam	CL	A–6	100	100	80 to 90	0.2 to 0.8	.18	6.8 to 7.3	Moderate.
Silt loam	ML–CL	A–4	100	100	80 to 90	0.2 to 0.8	.13	6.5 to 7.0	Low.
Silty clay loam	CL	A–6	100	100	80 to 90	0.2 to 0.8	.14	6.8 to 7.3	Moderate.
Clay loam	CL	A–6	100	100	80 to 90	0.2 to 0.8	.14	7.0 to 8.0	Moderate.
Clay loam	CL	A–7	100	100	85 to 95	0.05 to 0.2	.18	7.2 to 7.7	Moderate to high.
Fine sand	SP or SM	A–2, A–3	80 to 90	50 to 70	5 to 15	5 to 10	.07	7.5 to 8.0	Low.
Clay loam	CL	A–6 or A–7	100	100	50 to 70	0.05 to 0.2	.18	6.5 to 7.0	Moderate.
Clay	CH or MH	A–7	100	100	60 to 70	0.05 to 0.2	.18	7.0 to 7.5	High.
Fine sandy loam	SM	A–2, A–4	100	100	30 to 40	2.5 to 5	.14	6.0 to 6.5	Low.
Sandy clay loam	SC	A–6	100	100	40 to 50	0.8 to 2.5	.14	6.5 to 7.0	Moderate.
Sandy loam	SM	A–2	100	85 to 95	11 to 20	0.8 to 2.5	.12	6.5 to 7.0	Low.

TABLE 8.—*Brief description of soils of Dewey County, Okla., and*

Map symbol	Soil	Brief description of site and soil	Hydrologic soil group	Depth from surface
				Inches
NoE	Nobscot fine sand, rolling.	Duny or hummocky areas on uplands; well-drained, sandy soils.	A.	0 to 34 34 to 58 58 to 90
NpC	Nobscot-Pratt complex, hummocky.	Hummocky areas on uplands; well-drained, sandy soils.	See data	for Nobscot fine
Po	Port silt loam.	Bottom lands; well-drained, nearly level soils.	B.	0 to 35 35 to 60
Ps	Pratt fine sandy loam, 1 to 3 percent slopes.	Uplands; well-drained, nearly level, moderately sandy soils.	B.	9 to 12 12 to 30 30 to 48
PpB PpC	Pratt loamy fine sand, undulating. Pratt loamy fine sand, hummocky.	Hummocky and undulating areas on uplands; well-drained, sandy soils.	A.	0 to 11 11 to 31 31 to 60
Pt	Pratt-Tivoli loamy fine sands.	For data, see Pratt soils above or Tivoli fine sand.	See dataf	or Pratt soils above,
PrB	Pratt loamy fine sand, heavy subsoil variant, undulating.	Undulating and hummocky areas on uplands; well-drained, sandy soils.	B.	0 to 25 25 to 58 58 to 72
Qm Qn3	Quinlan loam. Quinlan soils, severely eroded.	Uplands; well-drained, sloping to very steeply sloping loamy soils, underlain by soft sandstone at a depth of 1 to 2 feet.	B.	0 to 11 11 to 54
Qp	Quinlan-Enterprise complex.	Uplands; sloping to very steeply sloping, mixed loamy and sandy soils, underlain by soft sandstone.	See data	for Quinlan loam,
QwC2 QwE	Quinlan-Woodward loams, 3 to 5 percent slopes, eroded. Quinlan-Woodward loams, 5 to 20 percent slopes.	Uplands; loamy soils, underlain by soft sandstone at a depth of 1 to 4 feet.	See data	for Quinlan loam,
Rb	Rough broken land.	Sandstone canyons; little developed soil material.	B.	Variable depth
SaA SaB SaC ScC2	St. Paul silt loam, 0 to 1 percent slopes St. Paul silt loam, 1 to 3 percent slopes. St. Paul silt loam, 3 to 5 percent slopes. St. Paul clay loam, 3 to 5 percent slopes, eroded.	Uplands; well-drained soils, underlain by soft sandstone at a depth of 10 to 12 feet.	C.	0 to 13 13 to 43 43 to 75
Sp	Spur clay loam, deep water table.	Bottom lands; clay loam, underlain by sandy substrata at a depth of about 3 feet; water table at 3 feet.	C.	0 to 36 36+
TpA	Tipton silt loam, 0 to 1 percent slopes.	Low terraces; well-drained, nearly level soils; water table at about 10 feet.	B.	0 to 20 20 to 52 52 to 72
Tv	Tivoli fine sand.	Rolling, sandy dunes; deep, sandy soils.	A.	0 to 36+
Vs3 Vx	Vernon soils, severely eroded. Vernon complex.	Rolling and broken uplands; soils underlain by claystone at a depth of 2 feet or less.	D.	0 to 11 11+
Wa	Wann soils.	Bottom lands; deep, level soils, subject to occasional overflow.	A.	0 to 45 45+
WbC	Woodward loam, 3 to 5 percent slopes.	Uplands; loamy soils, underlain by sandstone or packsand at a depth of about 3 feet.	B.	0 to 16 16 to 42 42+

their estimated physical and chemical properties—Continued

Classification			Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4	No. 10	No. 200				
						Inches per hour	*Inches per inch of soil*	*pH value*	
Fine sand	SP–SM	A–2, A–3	100	100	10 to 20	2.5 to 5	.07	5.8 to 6.3	Low.
Loamy fine sand	SP–SM	A–2, A–3	100	100	10 to 20	2.5 to 5	.07	5.8 to 6.3	Low.
Fine sand	SP–SM	A–2, A–3	100	100	5 to 15	5 to 10	.07	6.0 to 6.5	Low.
sand, rolling, or Pratt loamy fine sand, heavy subsoil variant, undulating.									
Silt loam	CL	A–6	100	100	80 to 90	0.2 to 0.8	.14	6.8 to 7.3	Moderate.
Clay loam	CL	A–6	100	100	80 to 90	0.2 to 0.8	.14	7.0 to 8.0	Moderate.
Fine sandy loam	SM	A–2, A–4	100	100	20 to 40	0.8 to 2.5	.14	6.4 to 6.9	Low.
Fine sandy loam	SM	A–2, A–4	100	100	20 to 40	0.8 to 2.5	.14	6.4 to 6.9	Low.
Loamy sand	SM	A–2, A–4	100	100	20 to 40	0.8 to 2.5	.07	6.4 to 6.9	Low.
Loamy fine sand	SM	A–2	100	100	15 to 25	5 to 10	.07	6.3 to 6.8	Low.
Loamy fine sand	SP–SM	A–2	100	100	11 to 20	2.5 to 5	.07	6.3 to 6.8	Low.
Loamy fine sand	SP–SM	A–2, A–3	100	100	5 to 15	5 to 10	.07	6.3 to 6.8	Low.
or data for Tivoli fine sand.									
Loamy fine sand	SM	A–2	100	100	11 to 20	0.8 to 2.5	.10	6.0 to 6.5	Low.
Sandy clay loam	SC	A–4, A–6	100	100	36 to 50	0.2 to 0.8	.15	6.4 to 6.9	Low.
Loamy fine sand	SM	A–2	100	100	11 to 20	0.8 to 2.5	.13	6.4 to 6.9	Low.
Loam	ML	A–4	100	100	60 to 70	0.8 to 2.5	.14	7.5 to 8.0	Low.
Loam	ML	A–4	100	100	70 to 80	0.8 to 2.5	.14	7.5 to 8.0	Low.
or for Enterprise fine sandy loam.									
or for Woodward loam.									
Loam	ML	A–4	100	100	70 to 80	0.8 to 2.5	.12	7.5 to 8.0	Low.
Silt loam	ML–CL	A–4	100	100	90 to 100	0.05 to 0.2	.14	6.5 to 7.0	Low.
Silty clay loam	CH	A–7	100	100	90 to 100	0.05 to 0.2	.18	6.5 to 7.0	High.
Clay loam	CL	A–6	100	100	80 to 90	0.05 to 0.2	.15	7.5 to 8.0	Moderate.
Silty clay loam	CL–CH	A–7	100	100	65 to 75	0.05 to 0.2	.18	7.5 to 8.0	High.
Loamy fine sand	SM	A–2	100	100	25 to 35	2.5 to 5	.07	7.5 to 8.0	Low.
Silt loam	ML–CL	A–4	100	100	80 to 90	0.2 to 0.8	.13	6.5 to 7.0	Low.
Silty clay loam	ML	A–4	100	100	80 to 90	0.2 to 0.8	.14	6.8 to 7.3	Moderate.
Clay loam	CL	A–6	100	100	80 to 90	0.2 to 0.8	.14	7.0 to 8.0	Moderate.
Fine sand	SP	A–3	100	100	0 to 10	5 to 10	.05	7.0 to 8.0	Low.
Clay loam	ML–CL	A–6	100	100	85 to 95	0.05 to 0.2	.18	7.0 to 7.5	Moderate.
Silty clay loam	CL	A–6	100	100	75 to 85	0.05 or less		7.0 to 8.0	Moderate.
Loam	ML	A–4	100	100	90 to 100	0.8 to 2.5	.12	6.8 to 7.3	Low.
Loamy fine sand	SP, SM	A–2	100	100	10 to 20	2.5 to 5	.12	7.0 to 7.5	Low.
Loam	ML	A–4	100	100	60 to 70	0.8 to 2.5	.12	7.0 to 7.5	Low.
Loam	ML–CL	A–4	100	100	60 to 70	0.8 to 2.5	.12	7.5 to 8.0	Low.
Loam	ML–CL	A–4	100	100	70 to 80	0.8 to 2.5	.12	7.5 to 8.0	Low.

TABLE 8.—*Brief description of soils of Dewey County, Okla., and*

Map symbol	Soil	Brief description of site and soil	Hydrologic soil group	Depth from surface
				Inches
WcB	Woodward-Carey complex, 1 to 3 percent slopes.	Uplands; deep, loamy soils underlain by soft sandstone at a depth of about 3 to 6 feet.	See data for	Woodward loam
WcC2	Woodward-Carey complex, 3 to 5 percent slopes, eroded.			
WcD2	Woodward-Carey complex, 5 to 8 percent slopes, eroded.			
WdB	Woodward-Dill fine sandy loams, 0 to 3 percent slopes.	Uplands; moderately sandy soils, underlain by soft packsand at a depth of about 3 feet.	See data for	Woodward loam
WwC	Woodward-Quinlan loams, 3 to 5 percent slopes.	Uplands; loamy soils, underlain by soft sandstone at a depth of 1 to 4 feet.	See data for	Woodward loam
Ya Yf	Yahola fine sandy loam, high. Yahola fine sandy loam.	Bottom lands; well-drained, level, moderately sandy soils, subject to occasional overflow.	B.	0 to 40 40 to 82

scribed in the Soil Conservation Service Engineering Handbook, supplement A, section 4, on Hydrology. They are grouped according to their ability to absorb water and to lose water through runoff. Group A consists mostly of sandy soils that have the highest intake rate and the least amount of runoff. Group D consists mostly of clays that have the lowest intake rate and the greatest amount of runoff.

The shrink-swell potential of a soil is based on the change in volume with changes in moisture content. Soils high in content of clay have a high shrink-swell potential. Generally, soils classified as CH and A–7 have a high shrink-swell potential. Clean sands and gravels (single-grain structure) and those having small amounts of nonplastic to slightly plastic fines, as well as most other nonplastic to slightly plastic soil materials, have a low shrink-swell potential.

Permeability of a soil refers to the volume of water that can be absorbed by the soil. This is often referred to as the intake rate. This rate is measured on undisturbed soil. Mechanically developed features, such as plowpans and surface crusting, have not been considered.

Available water capacity refers to the amount of water that is held by a soil and that is available to plants.

In table 9 are interpretations of specific soil features or characteristics that affect the use of the soils in the county for engineering construction. These interpretations were made after considering the performance of the soils in the field and after evaluating the estimated data in table 8 and the actual test data in table 10. Also shown are some specific soil features that affect engineering practices.

Table 10 is a summary of test data for eight typical soil profiles. The modal profile is one that is most nearly typical of the series. The nonmodal profile is one that has significant variations, though these are within the concept of the series or mapping unit. Samples were taken from the A, B, and C horizons. The depth at which these samples were taken is shown in the column headed "Depth from surface."

The tests for *liquid limit* measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic condition. If the moisture content is further increased, the material changes from a plastic to a liquid condition. The plastic limit is the moisture content at which the soil material passes from semisolid to plastic. The liquid limit is the moisture content at which the material changes from plastic to liquid. The *plasticity index* is the numerical difference between the liquid limit and plastic limit. It indicates the range of moisture content within which a soil material is plastic.

As moisture leaves a soil, the soil shrinks and decreases in volume in proportion to the loss in moisture, until a point is reached where shrinkage stops although additional moisture may be removed. The moisture content at which shrinkage stops is called the *shrinkage limit*. The shrinkage limit of a soil is a general index of clay content and generally will decrease as the clay content increases. The shrinkage limit of sand that contains little or no clay gives a test result that is close to the liquid limit and, therefore, is considered insignificant. Sand that contains some silt and clay has a shrinkage limit of about 14 to 25. Clay has a shrinkage limit of about 6 to 14. As a rule, the load-carrying capacity of a soil is at a maximum when its moisture content is at or below the shrinkage limit. Sand does not follow this rule, because if confined it has a uniform load-carrying capacity within a considerable range in moisture content.

The *shrinkage ratio* is the volume change resulting from the drying of a soil material, divided by the loss of moisture caused by drying. The ratio is expressed numerically. The volume change used in computing shrinkage ratio is the change in volume that will take place in a soil when it dries from a given moisture content to the point where no further shrinkage takes place.

The *field moisture equivalent* (FME) is the minimum moisture content at which a smooth soil surface will absorb no more water in 30 seconds when the water is added in individual drops. It is the moisture content required to fill all the pores in sands and to approach saturation in cohesive soils.

The *volume change from field moisture equivalent* is the

their estimated physical and chemical properties—Continued

Classification			Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4	No. 10	No. 200				
						Inches per hour	*Inches per inch of soil*	*pH value*	
or for Carey silt loam.									
or for Dill fine sandy loam.									
or for Quinlan loam.									
Fine sandy loam	SM	A-4	100	100	40 to 50	2.5 to 5	.12	7.0 to 7.5	Low.
Fine sandy loam	SM	A-4	100	100	40 to 50	2.5 to 5	.12	7.5 to 8.0	Low.

volume change, expressed as a percentage of the dry volume, of the soil mass when the moisture content is reduced from the field moisture equivalent (FME) to the shrinkage limit.

In *mechanical analysis*, the soil components are sorted by particle size. In the AASHO classification, all soils can be designated as either granular materials or silt-clay materials, depending on what proportion of particles passes the No. 200 sieve. Granular materials are those in which more than 35 percent of the soil particles are larger than the openings in a No. 200 sieve. Sand and other granular material are retained on the No. 200 sieve. Silt-clay materials are those in which more than 35 percent of the soil particles are smaller than the openings in a No. 200 sieve. The fine particles are further subdivided into size classes by the hydrometer test, and the size classes are expressed in millimeters. Clay is the fraction smaller than 0.005 millimeter in diameter. The material intermediate in size between that held on the No. 200 sieve and that having a diameter of 0.005 millimeter is called silt.

The engineering soil classifications in table 10 are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. Mechanical analyses were made by combined sieve and hydrometer methods. Percentages of clay, obtained in this test by the hydrometer, are not suitable for determining USDA soil textural classes.

Use of conservation structures by soil associations

Topography and soil condition determine to a large extent the types of conservation structures that are practical in an area. The practicability of such structures, by soil associations, or general soil areas, in Dewey County is discussed in this section. For a more detailed description of each soil association, turn to the section "General Soil Map." A colored map near the back of this report shows the general extent and location of the soil associations in the county.

Association 1.—This association is made up of loamy soils mainly on long, gentle slopes on dissected uplands, and much of the acreage is cultivated. St. Paul, Carey, and Holdrege soils are dominant. Because of the long slopes and well-defined drains, the soils are subject to considerable water erosion. The cultivated areas are subject to some wind erosion unless sufficient cover is left on the surface for protection.

Level diversion terraces can be used effectively to control water erosion on the more gentle slopes. Impounding-type terraces can be used on slopes of 0.5 to 3 percent if provisions are made for draining the channels, should this become necessary. On slopes of more than 3 percent, level channel-type or ridge-type terraces generally are satisfactory if the ends are partially blocked or if they open to suitable outlets. If open-end terraces are constructed, vegetated waterways may be needed. In some places, erosion-control dams are needed to lower excess runoff to a base grade.

The deep gullies that occur in many places throughout this association can be effectively controlled by small diversion terraces or by pipe drops.

The grassland in this association is subject to considerable sheet erosion if improperly grazed, and some of the paths made by livestock are gullied. Diversion terraces and pipe drops will help to control erosion in most of these areas, but in a few places erosion control dams are needed.

Water for livestock generally is stored behind impounding-type dams. Because of the movement of silt, the drainage area should consist almost entirely of grassland.

Conservation structures work well in this area. Little or no seepage will occur if the structures are properly constructed. Vegetation grows readily.

Association 2.—Soils of the red-bed hills make up this association. These soils are mostly on steep side slopes or in nearly level areas at the top and base of slopes. Quinlan and Woodward soils are dominant. A few small, nearly level areas are cultivated, but most of the acreage is in range.

Many deep gullies are eating back into the higher cultivated areas. Pipe drops are about the only satisfactory method of controlling this erosion. Water can be diverted from several gullies to one pipe-drop structure by means of diversion terraces. Because of the steep slopes, waterways generally are not suitable.

TABLE 9.—*Interpretation of*

Soil series	Suitability as source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Highway location	Construction of farm ponds: Reservoir area
Alluvial land	Fair to good when upper 2 ft. is mixed.	Substratum good for concrete sand and gravel; well graded from 2 inches down to fine sand.	Good; quantity limited because of high water table.	Frequent overflow; high water table.	Level topography; suitable for dug ponds because of high water table.
Brazos	Fair; noncohesive.	Substratum good for concrete sand and gravel; well graded from 2 inches down to fine sand.	Good if slopes are stabilized.	High erodibility	Excessive seepage
Broken land	Good but limited in quantity.	Poor for sand; local deposits of gravel suitable for road surfacing or farm use.	Good but limited in quantity.	Steep slopes; rough topography.	Narrow deep drains provide good impoundment; low seepage.
Canadian	Good	Poor; sources limited and localized below 8 feet.	Good	Level topography	Level topography; low seepage.
Carey	Good	Not suitable	Good	Features favorable; soft sandstone below a depth of 4 to 6 feet.	Variable; seepage in sandstone.
Carwile	Fair	Not suitable	Poor to fair; wet for long periods during the year.	Depressed topography; poor drainage.	Features favorable
Dill	Fair	Not suitable	Fair; slopes easily eroded.	Erodible on cut slopes	High seepage
Enterprise	Good	Poor; sources limited and localized.	Good	Variable slopes	Low seepage
Eroded sandy land.	Fair but limited in quantity.	Poor	Good if slopes are stabilized.	High erodibility	High seepage; subject to siltation.
Farnum	Fair to good	Not suitable	Good	Features favorable	Level topography
Holdrege	Good	Not suitable	Good	Features favorable	Level topography
Lincoln	Fair to good but limited in quantity.	Substratum good for concrete sand and gravel; well graded from 2 inches down to fine sand.	Surface poor; good below a depth of ½ foot.	Frequent overflow; high water table.	Level topography; suitable for dug ponds because of high water table.
Lofton	Fair	Not suitable	Poor; plastic clay	Depressed topography; poorly drained; plastic clay.	Low seepage
Miles	Fair to good	Not suitable	Good	Variable slopes	Moderate seepage
Nobscot	Poor	Not suitable	Good if slopes are stabilized.	Duned topography; erodible on cut slopes.	High seepage
Port	Good	Not suitable	Good	Level topography	Low seepage

engineering properties of soils

Soil features affecting—Continued				
Construction of farm ponds—Continued: Embankment	Agricultural drainage	Irrigation	Terraces and diversions	Waterways
Not suitable; high seepage in substratum.	Lake areas need drainage, but outlets are a problem.	High water table; frequent overflow.	Not needed because of flat topography.	Substratum highly erodible.
High erodibility; high seepage.	Good natural drainage	Low water-holding capacity; high intake rate.	Subject to severe wind erosion.	Subject to wind erosion; low water-holding capacity.
High strength and stability.	Not arable	Not arable; steep slopes	Not arable; steep slopes	Not arable; steep slopes.
High strength and stability.	Good natural drainage	Level topography; deep; moderate permeability; moderate water-holding capacity.	Level topography; soil properties suitable.	Level topography; stable; fertile.
Moderate to high strength and stability.	Good natural drainage	Variable slopes	Features favorable	Deep; fertile.
Moderate to high strength and stability.	Needs surface drainage, but outlets are a problem.	Variable slopes; poorly drained subsoil.	Uneven topography	Uneven topography.
High seepage; subject to piping; slopes easily eroded.	Good natural drainage	Variable slopes; high permeability; high intake rate.	High permeability; high erodibility.	High erodibility.
High strength and stability.	Good natural drainage	Variable slopes	Fine sandy loam; high erodibility.	Features favorable.
Slopes easily eroded	Good natural drainage	Not arable; excessive erosion.	Subject to severe wind and water erosion.	Subject to severe wind and water erosion; low water-holding capacity.
High strength and stability.	Good natural drainage	Moderate permeability; high water-holding capacity.	Level topography	Level topography; stable; fertile.
Moderate to high strength and stability.	Good natural drainage	Moderate permeability; high water-holding capacity.	Level topography	Level topography; stable; fertile.
High seepage; slopes easily eroded.	Seasonal water table	Not arable; frequent overflow.	Level topography	Highly erodibile subsoil.
Subject to cracking	Needs surface drainage, but outlets are a problem.	Depressed topography; water ponds.	Depressed topography; subject to cracking.	Low water infiltration.
High strength and stability.	Good natural drainage	Variable slopes; otherwise favorable.	Features favorable	Features favorable.
High seepage and erodibility.	Good natural drainage	Variable slopes; low water-holding capacity; high intake rate.	Subject to severe wind erosion.	Subject to severe wind erosion; droughty.
High strength and stability.	Good natural drainage	Features favorable	Level topography	Deep; fertile.

TABLE 9.—*Interpretation of engineering*

Soil series	Suitability as source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Highway location	Construction of farm ponds: Reservoir area
Pratt	Fair to good	Poor	Good if slopes are stabilized.	Variable sandy slopes; erodible on cut slopes.	High seepage
Pratt, heavy subsoil variant.	Fair to good	Poor	Good	Level topography	Moderate to low seepage.
Quinlan	Poor	Not suitable	Good; sandstone material.	Limited depth to sandstone.	Limited depth to sandstone.
Rough broken land.	Poor	Not suitable	Good; sandstone material.	Large sandstone canyons.	Limited depth to sandstone; moderate lateral seepage.
St. Paul	Good	Not suitable	Fair; plastic clay	Plastic clay below a depth of 1½ feet.	Low seepage
Spur	Good	Poor; plastic clay to a depth of 3 feet; fair below 3 feet.	Fair; plastic clay to a depth of 3 feet.	High water table	Low seepage; suitable for dug ponds because of high water table.
Tipton	Good	Poor; sources limited and localized.	Good	Level topography	Level topography
Tivoli	Poor	Poor	Good if slopes are stabilized.	High erodibility	Excessive seepage
Vernon	Poor	Not suitable	Fair; claystone material.	Limited depth to claystone; rough topography.	Limited depth to claystone.
Wann	Good	Poor	Good if slopes are stabilized.	Occasional overflow	Level topography; moderate seepage.
Woodward	Fair to good	Not suitable	Good	Sandstone below 3 feet	Limited depth to sandstone.
Yahola	Good	Poor; sources limited and localized.	Good	Occasional overflow	Level topography; moderate seepage.

The lower cultivated areas are cut by drains and frequently are covered by water and silt after heavy rains. Diversion terraces and waterways generally can be used to control runoff in these areas.

Grassland that is improperly grazed is subject to severe erosion. If this erosion is to be controlled, a good conservation grazing plan is imperative. Pipe drops can be used to control further erosion of the smaller gullies.

Water for livestock generally is stored behind impounding-type dams. Emergency spillways commonly are not satisfactory. Pipe spillways are needed, and the drainage areas should be kept in a good vegetative cover at all times.

Associations 3 and 4.—These associations consist of nearly level to steep very sandy soils in rolling and hummocky areas and on sandy upland flats. Nobscot soils and the Pratt soils that have a heavy subsoil are dominant in association 3, and Miles, Pratt, and Carwile soils are dominant in association 4.

Most of the acreage has a cover of black jack oak, shinnery oak, and sand sagebrush, but some small areas are cultivated. Because of the hazard of wind erosion, terraces and diversion terraces generally are not practical.

Most of the water for livestock is provided by wells. Impounding-type dams for storing water are successful in only a few places. In some areas, reservoirs or pit-type ponds have proven satisfactory if the water is piped in and there are no outlets.

Association 5.—The soils in this association are mainly on benches and flood plains. Tipton, Enterprise, and Lincoln soils are dominant. Most of the acreage on benches is cultivated; the rest is in grass. Most of the cultivated acreage is on long, nearly level slopes.

Runoff from higher areas is a serious problem in this association. It can be effectively controlled by diversion terraces and waterways. Diversion terraces should be slightly graded or level with open ends.

properties of soils—Continued

Soil features affecting—Continued				
Construction of farm ponds—Continued: Embankment	Agricultural drainage	Irrigation	Terraces and diversions	Waterways
High seepage and erodibility.	Good natural drainage	Variable slopes; low water-holding capacity; high intake rate	Subject to severe wind erosion.	Subject to severe wind erosion; low water-holding capacity.
High strength and stability.	Good natural drainage	Billowy topography; high water intake rate; moderate water-holding capacity.	Billowy topography	Billowy topography.
Limited fill material	Good natural drainage	Shallow	Shallow	Shallow; droughty.
Limited fill material	Good natural drainage	Not arable; steep slopes; shallow.	Steep slopes; shallow	Steep slopes; shallow.
High strength and stability.	Good natural drainage	Variable slopes; deep; high water-holding capacity; moderate intake rate.	Features favorable	Features favorable.
High strength and stability.	Good surface drainage; water table at 3 feet.	Subirrigated	Level topography	Level topography; fertile.
High strength and stability.	Good natural drainage	Moderate permeability; high water-holding capacity.	Level topography	Deep; fertile.
Excessive seepage; high erodibility.	Excessive natural drainage.	Not arable; rapid intake rate; low water-holding capacity.	Subject to severe wind erosion.	Subject to severe wind erosion; low water-holding capacity.
Limited fill material	Good natural drainage	Not arable; shallow	Shallow over claystone	Shallow; droughty.
Moderate seepage; slopes easily eroded.	Good natural drainage	Moderate intake rate and water-holding capacity; occasional overflow.	Level topography	Level topography; deep; fertile.
High strength and stability.	Good natural drainage	Limited depth to sandstone; variable topography.	Features favorable	Features favorable.
High strength and stability.	Good natural drainage	Moderate intake rate and water-holding capacity; occasional overflow.	Level topography	Level topography; deep; fertile.

Streams supply water for livestock. Occasionally, the streams are dry on the surface, but an excavation a few feet deep will produce ample water for livestock.

Association 6.—This association consists mostly of soils on sand dunes and breaks. Pratt, Quinlan, and Enterprise soils are dominant. The soils are not suitable for cultivation, and most of the acreage is in grass. There is considerable sand sagebrush and skunkbrush in the vegetative cover. Wells and reservoirs supply water for livestock.

Association 7.—This association consists of nearly level to steep soils that are deeply dissected by drains. These soils are on the sandy uplands and red-bed hills. Woodward, Dill, and Miles soils are dominant.

Most of the nearly level to gently sloping areas are cultivated. These areas are subject to both wind and water erosion. Impounding-type terraces will work satisfactorily in many of the cultivated fields if sufficient crop residues are left on the surface to control wind erosion. The terraces should be level and blocked at both ends. Where runoff is excessive, erosion control dams are needed to lower the water to base grade.

Water for livestock is provided by wells. If silting can be controlled, however, impounding-type dams can be used in the red-bed areas to store water.

Genesis, Morphology, and Classification of Soils

In this section the factors that have affected the development and composition of the soils of Dewey County are discussed. Also discussed is the classification of the soils by higher categories. Table 11 shows the classification of the soil series by orders and great soil groups and includes some factors that affect morphology.

TABLE 10.—*Engineering test data for soil samples taken*

[Tests performed by Oklahoma Department of Highways in accordance with

Soil type and location	Parent material	Oklahoma report number	Depth from surface	Horizon	Shrinkage Limit	Shrinkage Ratio
			Inches			
Carey silt loam: 220 feet south and 360 feet east of NW. cor. NE¼ sec. 10, T. 19 N., R. 18 W. (modal).	Permian packsand, sandstone, or sandy shale.	SO–3871	6 to 22	A_1	20	1.75
		SO–3872	22 to 42	B_2	17	1.79
		SO–3873	52 to 96	C	17	1.77
620 feet south and 160 feet east of NW. cor._sec. 1, T. 19 N., R. 18 W. (heavy subsoil).	Permian packsand, sandstone, or shale.	SO–3868	5 to 23	A_1	17	1.75
		SO–3869	23 to 39	B_2	13	1.89
		SO–3870	53 to 84	C	18	1.77
Miles fine sandy loam: 180 feet east and 60 feet north of SW. cor. NW¼ sec. 3, T. 19 N., R. 20 W. (modal).	Old alluvium or plains outwash.	SO–3880	0 to 5	A_p	14	1.86
		SO–3881	8 to 25	B_2	12	1.89
		SO–3882	46 to 75	C	(4)	(4)
Nobscot fine sand: NE. cor. NW¼ SE¼ sec. 17, T. 17 N., R. 14 W. (modal).	Old eolian material (Quaternary sands).	SO–3883	7 to 34	A_2	(4)	(4)
		SO–3884	34 to 58	B_2	(4)	(4)
		SO–3885	58 to 90	C	(4)	(4)
Pratt loamy fine sand: 50 feet north of NE. cor. NW¼ sec. 8, T. 19 N., R. 20 W. (modal).	Tertiary and Quaternary deposits.	SO–3888	0 to 11	A_1	(4)	(4)
		SO–3889	11 to 31	B_2	(4)	(4)
		SO–3890	31 to 60	C	(4)	(4)
Quinlan loam: 790 feet south and 1,050 feet SE. of center of sec. 23, T. 19 N., R. 16 W. (modal).	Sandstone or silty Permian red-bed material.	SO–3886	3 to 10	A_1	19	1.66
		SO–3887	30 to 45	C	21	1.63
St. Paul silt loam: 520 feet west and 65 feet south of NE. cor. SE¼ SW¼ sec. 32, T. 19 N., R. 17 W. (modal).	Permian red-bed material	SO–3877	6 to 13	A_1	18	1.73
		SO–3878	29 to 43	B_{22}	9	2.02
		SO–3879	52 to 75	C	14	1.87
390 feet south of NW. cor. SW¼ sec. 29, T. 16 N., R. 16 W. (heavy subsoil).	Permian red-bed material	SO–3874	0 to 14	A_1	19	1.74
		SO–3875	31 to 41	B_{22}	13	1.90
		SO–3876	60 to 75	C	10	1.99

[1] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 2, Ed. 7): Mechanical Analysis of Soils, AASHO Designation: T 88–54. Results by this procedure frequently may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-sized fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes of soils.

Factors of Soil Formation

Soils are mixtures of fragmented and partly weathered rock and minerals with organic matter, water, and air in greatly varying proportions. The important factors in soil formation are parent material, climate, plant and animal life, relief, and time.

Climate and vegetation are the active factors of soil formation. They act on the parent material accumulated through the weathering of rocks and minerals and slowly change it into a natural body that has, in many but not all places, genetically related horizons. But the effects of climate and vegetation are dependent on relief or topography. The kind of parent material also affects the kind of profile that can be formed and, in extreme cases, dominates it entirely. Finally, time influences soil formation. It may be much or little, but generally much time is required to develop soil profiles that have strongly expressed horizons.

The individual factors of soil formation are discussed separately in the paragraphs that follow. It is the interaction of all these factors, however, that determines the nature of the soil profile. The interaction among the five factors is complex. The effects of any single factor are difficult to isolate.

Parent material

Parent material is of two types—residual and transported. Residual material is that which has weathered

from soil profiles in Dewey County, Okla.

standard procedures of the American Association of State Highway Officials (AASHO)]

Volume change from field moisture equivalent	Mechanical analysis [1]								Liquid limit	Plasticity index	Classification	
	Percentage passing sieve—					Percentage smaller than—						
	¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.005 mm.	0.002 mm.			AASHO [2]	Unified [3]
Percent												
4	--------	--------	--------	100	71	41	17	14	25	5	A-4(7)	ML-CL.
12	--------	--------	--------	100	69	42	19	17	26	5	A-4(7)	ML-CL.
10	--------	--------	--------	100	46	29	13	12	22	3	A-4(2)	SM.
18	--------	--------	--------	100	78	51	21	18	28	8	A-4(8)	CL.
44	--------	--------	--------	100	76	49	28	26	39	19	A-6(12)	CL.
14	--------	--------	--------	100	72	42	20	17	28	7	A-4(8)	ML-CL.
4	--------	--------	100	91	32	25	12	11	18	1	A-2(0)	SM.
35	--------	--------	100	94	45	37	24	23	33	14	A-6(3)	SC.
(4)	100	93	90	71	14	10	8	7	(5)	(5)	A-2-3(0)	SM.
(4)	--------	--------	100	96	14	6	3	2	(5)	(5)	A-2-3(0)	SM.
(4)	--------	--------	100	94	15	11	10	10	(5)	(5)	A-2-3(0)	SM.
(4)	--------	--------	100	93	9	7	5	4	(5)	(5)	A-3(0)	SP-SM.
(4)	--------	--------	100	97	19	15	8	7	(5)	(5)	A-2-3(0)	SM.
(4)	--------	--------	100	98	12	10	9	8	(5)	(5)	A-2-3(0)	SP-SM.
(4)	--------	--------	100	98	9	7	7	7	(5)	(5)	A-3(0)	SP-SM.
9	--------	--------	100	99	64	35	13	10	27	4	A-4(6)	ML-CL.
8	--------	--------	100	99	74	40	12	9	25	2	A-4(8)	ML.
10	--------	--------	--------	100	93	66	20	17	31	9	A-4(8)	ML-CL.
60	--------	--------	--------	100	95	76	42	37	55	30	A-7-6(19)	CH.
31	--------	--------	--------	100	86	63	29	26	34	18	A-6(11)	CL.
18	--------	--------	--------	100	92	66	23	20	33	10	A-4(8)	ML-CL
46	--------	--------	--------	100	90	66	35	31	44	24	A-7-6(14)	CL.
55	--------	--------	--------	100	92	76	39	35	46	24	A-7-6(15)	CL.

[2] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 7): Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation: M 145-49. Oklahoma Department of Highways classification procedure further subdivides the AASHO A-2-4 subgroup into the following: A-2-3(0) when PI=nonplastic; A-2(0) when PI=NP to 5; and A-2-4(0) when PI=5 to 10.

[3] Based on the Unified Soil Classification System, Tech. Memo. 3-357, v. 1, Waterways Experiment Station, Corps of Engineers, March 1953.

[4] Insignificant.

[5] NP=Nonplastic.

from parent rock, in place. Transported material in Dewey County consists of alluvium and eolian materials.

Sedimentary rocks, in horizontal beds that tilt slightly to the southwest, underlie the entire county. These rocks formed in the Permian seas and are called red beds. They consist of sandstone, packsand, gypsum, dolomite, claystone, and satin spar. Red-bed material occupies about 60 percent of the area of the county. A band in the north-central part broadens as it extends southward, so that nearly the entire southern part of the county has red-bed material.

Soils formed from red-bed parent material have certain characteristics that are relatively uniform. In most areas, the surface layer is loam or silt loam. Along the eastern edge of the county, where packsand is the dominant parent material, the surface layer is sandy loam. In small areas where the parent material consists of thin beds of contrasting material, the texture of the surface layer ranges from sandy loam to clay loam.

The subsoil is not uniform in texture, because this characteristic is also strongly influenced by topography and time. Color, though within a consistent range, varies among soils as a result of the effect of soil-forming factors other than parent material.

The content of lime in soils formed from red-bed parent materials, though related to the parent material, is also closely related to time. Generally, the more youthful the soil, the higher the content of lime. The one exception is the Dill soils, which formed in noncalcareous parent material at the eastern edge of the county.

Transported parent material consists of (1) alluvium on first bottoms, second bottoms, and terraces, and (2) dune sands, loess, old volcanic ash, and old, high Pleistocene stream deposits. The transported material occurs as three broad isolated areas in the eastern, northwestern, and west-central parts of the county and also in bands that parallel the North Canadian and South Canadian Rivers. This material ranges from a thin veneer of sand and silt overlying residual material to deposits of gravelly and sandy material more than 90 feet thick. The particle sizes vary widely, but sand and silt are the most common. With the exception of dune sands and some alluvium, the parent material is highly calcareous. The windblown material is more uniform in texture, but the alluvium contains strata of coarser textured material and some fine-textured or medium-textured material. An occasional band of gravel occurs below the windblown material.

The four geological periods represented by surface geology in Dewey County are the Permian, Cretaceous, Tertiary, and Quaternary (fig. 22).

PERMIAN.—The Permian Red Beds were deposited as nearly level plains. They have been altered, however, by the rise of the Flint Hills monocline. Surface relief now ranges from nearly level to rough and broken, or canyon-like.

Four formations of the Permian system are represented in Dewey County: the Quartermaster, Cloud Chief, Rush Springs, and Marlow. The Rush Springs sandstone and the Marlow formation are commonly called the Whitehorse group.

Quartermaster formation.—The Quartermaster formation outcrops in the southwestern part of the county and is confined to the high hills north and northwest of Leedey. It occurs on rolling topography dissected by raw, red canyons and dotted with high hard-capped buttes.

The Quartermaster formation lies unconformably on the Cloud Chief formation. It consists largely of claystone and sandy shale. Originally, it was from 150 to 300 feet thick. Thin beds of sandstone, dolomite, and compacted mud occur in places. Lentils of gypsum are impregnated throughout the strata. White sandy streaks embedded in the shale and claystone, erratic dips in the beds, and cross-bedding further characterize the formation.

This is the youngest exposed Permian formation in Oklahoma. It consists wholly of the Doxey member.

Cloud Chief formation.—The Cloud Chief formation makes up about 30 percent of the surface area of Dewey County. It occurs through the central part of the western half of the county and throughout the southern third, except in the deeper permanent drainageways. It underlies a large proportion of the arable soil in the county. The topography ranges from level to rolling and becomes more strongly sloping where the Cloud Chief formation is in contact with Rush Springs sandstone.

This formation ranges from fine-grained, light-colored sandstone to dark-red shale. Its outstanding characteristic is the extreme interbedding of red shale and sandstone with apparent collapsed gypsum structures. In places, gypsum is interbedded with red shale. The shale beds in Dewey County contain less clay and more silt than do most other Permian shales of Oklahoma, such as the Flower Pot shale formation. Another characteristic of this formation is the impregnation of the beds with satin spar and gypsum, both at joints and along the bedding planes. Dolomite layers occur within the formation, commonly as caprock. The best known is the basic Day Creek member. Scattered deposits of Pleistocene gravel and sand, volcanic ash, silt, and clay occur on many ridges and high flats throughout much of this formation.

Widely scattered Pleistocene deposits indicate that ancient stream channels once flowed across the Cloud Chief formation in much different positions than the present channels. These streams belonged to an older drainage pattern of the South Canadian River. After stream piracy of the older South Canadian River by one of its own tributaries and the adjustment of the channel to the southwesterly dip of the Permian Red Beds, the South Canadian River formed its present drainage pattern.[10]

The well-distributed, unconforming deposits of sand and gravel, as well as the extensive sand and gravel deposits in the vicinity of Webb and Oakwood, are indications of this change in drainage pattern. Further indications are the invariable deposits of clay and fine silt, as much as 20 feet thick, that form a veneer over the Cloud Chief cut bench south of Taloga and near Putnam. The positions of the older channel and the present channel of the South Canadian River, as well as the major deposits, are shown in figure 23. Throughout this area, buried soils are common.

Whitehorse group.—The Rush Springs sandstone and the Marlow formation make up the Whitehorse group, which occupies about 30 percent of the surface area in Dewey County. This group occurs in a wide band that extends in a northwesterly-southeasterly direction through the eastern third of the county. It also occurs as conspicuous buttes and canyon bluffs in a continuous narrow band along both sides of the South Canadian River. Deepened drainageways to the south, along the Custer County line, are also of the Rush Springs formation. The Marlow formation is of minor extent in the county and is exposed only in isolated areas and as bedrock of the South Canadian River.

The Rush Springs sandstone is directly over the Marlow formation. Both consist of interbedded fine-grained sandstone and soft packsand and an occasional outcrop of gypsum and sandy shale. A dolomite layer occurs at the top of the Rush Springs sandstone. At the contact of the Rush Springs sandstone and the Marlow formation at the eastern edge of the county, there is a considerable area of noncalcareous sandstone from which the parent material of the Dill soils was derived.

CRETACEOUS.—The only Cretaceous materials in Dewey County are erosional remnants in the vicinity of Cestos. These remnants consist of shell beds and weakly cemented calcareous beds. They occur as very small knobs or hills.

TERTIARY.—Tertiary deposits occupy less than 5 percent of the surface area of Dewey County and occur only in the extreme northwestern part. They consist of high-plains outwash from the Rocky Mountains. The surface is a dissected plain on which there are scattered sand dunes. This plain is the remnant edge of a broad area to the northwest. The deposits include volcanic ash, dune sand, and gravel beds of early Pleistocene age.

[10] ROBERT O. FAY. PLEISTOCENE COURSE OF THE SOUTH CANADIAN RIVER IN CENTRAL WESTERN OKLAHOMA. Oklahoma Geology Survey Notes, v. 19, No. 1, 15 p., illus. 1959.

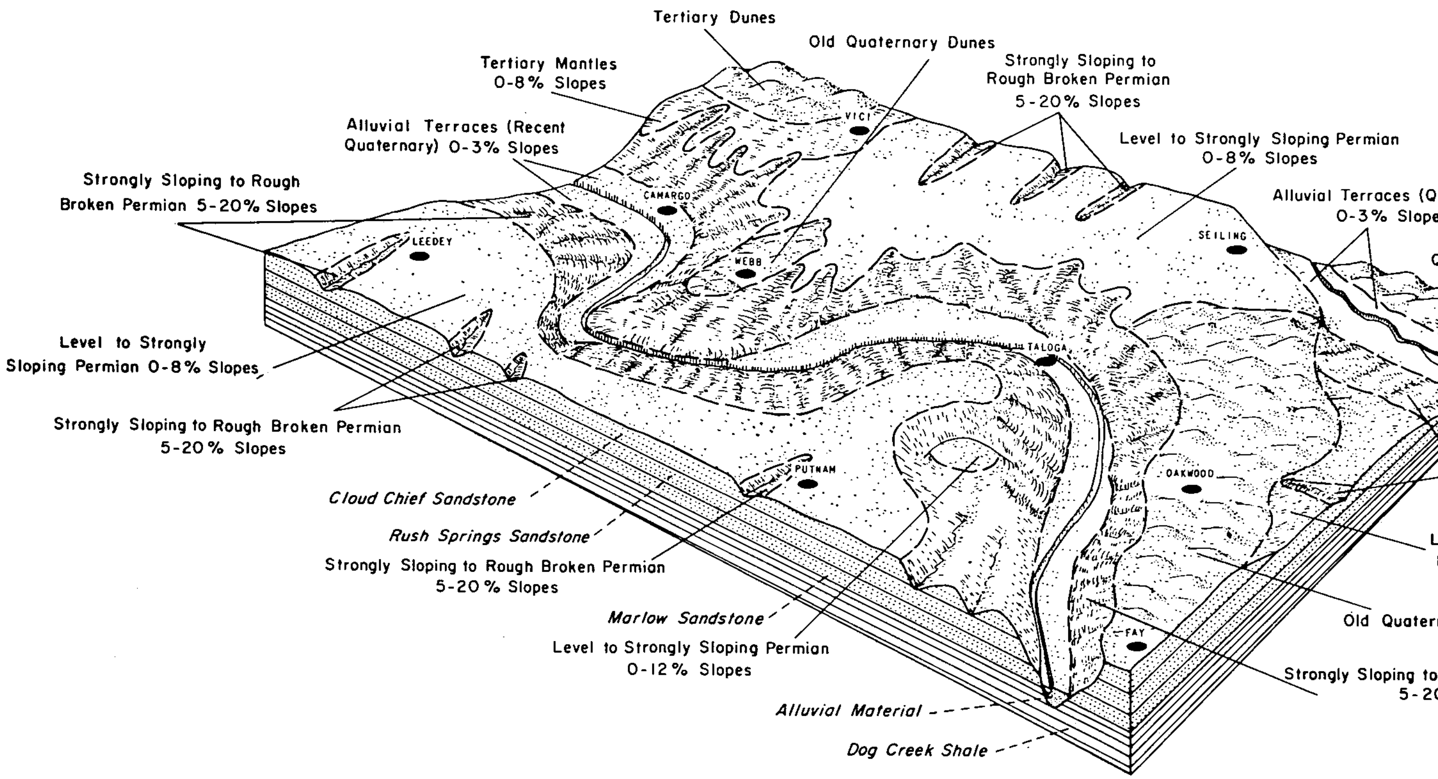

Figure 22.—**Generalized geology and relief map of Dewey County, Okla. Area covered is approximately 42 miles long an**

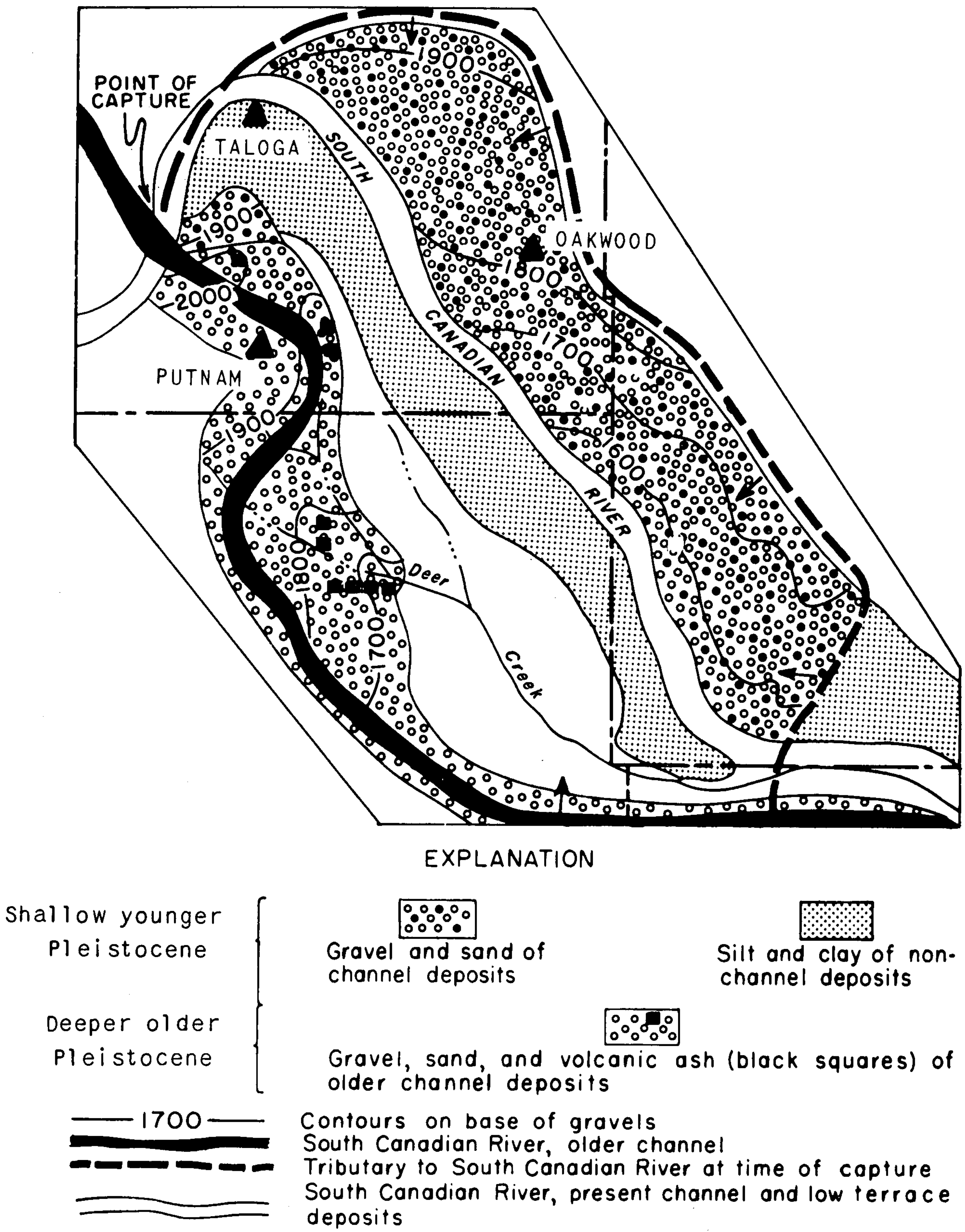

Figure 23.—Geology map of the Pleistocene deposits showing probable position of the older South Canadian River and its tributary. Arrows indicate direction of shift of channels after piracy. Courtesy of Carl C. Branson, director, Okla. Geol. Survey, Univ. of Okla.

QUATERNARY.—Quaternary deposits make up 35 percent of the surface area of Dewey County and occur as recent alluvium, high terraces, and dune sands. These deposits are extensive in the vicinity of Oakwood and Webb and in areas paralleling the Canadian Rivers. The higher quaternary deposits were laid down mainly in the Pleistocene epoch and are the effects of stream piracy and the channel adjustment of the South Canadian River. (See fig. 23.)

Five terraces above the flood plain of the South Canadian River can be distinguished. They range from low, recent deposits of sandy alluvium to a high, isolated deposit of volcanic ash that is probably of late Kansan age. This highest terrace occurs in the Oakwood area and has been greatly modified and shifted by wind to produce dunes. This terrace and also the one near Webb, which are locally known as sandy mantles, are probably older than the high terrace of the JV and Trail Flats, but all of them were deposited in late Kansan age and are considered here as part of the same terrace. The second highest terrace is of about the same age and material and is only about 25 to 30 feet lower. The next two lower terraces are devoid of sand dunes and are less dissected and more well defined than the two highest terraces. These intermediate terraces are of Illinoian age. The fifth and lowest terrace lies about 100 feet above the present flood plain. It has extremely well defined boundaries that form the margins of the present river flood plain.

Climate

Dewey County has a temperate, subhumid, continental climate. Summer is hot and somewhat dry, and the humidity is low much of the time; fall is moderately warm and pleasant but has occasional periods of moderate to heavy rain; winter is open and is moderate to cold; spring is variable, has more precipitation than the other seasons, and is commonly windy.

The major effect of climate as a soil-forming factor is the translocation of soil material through the action of moisture. Since precipitation in the county is moderate and evaporation is high, the translocation of material through the soil, either in solution or in colloidal suspension, generally is slow. In places, translocation has been offset by the addition of new soil material.

The presence of and the depth to a lime zone in the soil indicate the average depth to which water moves. In clayey, sloping soils, water penetrates to a depth of only a few inches, but in permeable, nearly level soils, it penetrates to a depth of several feet. Very sandy soils have no distinct lime zone. Sloping or steep soils and soils formed in extremely limy material are limy at the surface.

Other soil nutrients and organic matter, or even soil particles in colloidal suspension, may be translocated by water in much the same manner as lime, but not at the same rate.

Water and wind may have a destructive effect on soil formation, since they tend to move sloping or sandy soils laterally.

The climate is fairly uniform throughout Dewey County. Consequently, few of the differences among soils result directly from differences in climate. The climate is, however, directly or indirectly the cause of many variations in plant and animal life, which, in turn, result in differences in the soils.

Living organisms

Plants, micro-organisms, earthworms, and various other organisms that live on and in the soil are active in soil-forming processes. The kinds of organisms on and in the soil are determined by environmental factors such as climate, parent material, relief, age of the soil, and associated organisms.

Both plants and animals add organic matter to the soils when they die, but plants provide most of it. Bacteria, fungi, and other micro-organisms decompose organic matter, convert humus to simpler forms, and liberate plant nutrients; and some bacteria fix nitrogen. The larger organisms, such as earthworms, millipedes, and ants also are important in the translocation of plant residues, in soil aeration, and in the improvement of soil structure.

Plants, particularly grasses, add large amounts of organic matter to the soils. Through their roots, grasses bring plant nutrients from deep in the soils. When the grasses die, these nutrients are deposited on and near the surface. This process somewhat offsets the effects of leaching. In addition, grasses use large amounts of water and thereby help to limit leaching.

Trees also bring plant nutrients from deep in the soils and then deposit them on the surface in the form of leaves, twigs, and branches. Trees add less organic matter than grasses, however.

Vegetation has a great effect on the morphology and fertility of soils. In Dewey County this can be illustrated by comparing some profile characteristics of a soil formed under forest vegetation with those of a soil formed under prairie vegetation.

The forest vegetation consisted chiefly of post oak and shinnery oak, but some tall grasses grew beneath the trees. The trees grew chiefly on soils consisting of the more sandy transported parent material. On some of the sandiest soils, oak and sand sagebrush were dominant, and tall grasses were subdominant.

The prairie vegetation consisted chiefly of tall grasses but included some mid and short grasses. The grasses grew chiefly on soils consisting of the finer textured, transported parent material and of residuum derived from red beds.

In soils formed under forest, the dark-colored A horizon is thinner and is lower in content of organic matter. Also, soil colloids have been moved from the upper part to the lower part of the profile, and the depth to the accumulated lime is greater than in the soils formed under grasses. The presence of an A_2 horizon (lighter colored and leached) in some soils formed in sandy parent material indicates that oak and sand sagebrush were the dominant vegetation, and that tall grasses were subdominant.

Relief

Relief, or topography, may speed up or retard the effects of the other soil-forming factors. On steeply sloping soils, much of the water runs off. Consequently, geologic erosion may almost keep pace with the weathering of rock and with soil formation. The upper layer is constantly being shifted or removed so that genetically related horizons do not form. On more nearly level topography, runoff is not so rapid and soil formation advances more rapidly. Thus, as a rule, the more nearly level soils are deeper and are well developed. On sandy soils where infiltration and surface drainage are more rapid, especially

under forest vegetation, relief may have much less effect on soil formation. Thus, while relief is significant as a modifier of effects of climate, its influence on soil development depends on time, vegetation, and parent material.

Time

The length of time a soil material has been exposed to other soil-forming factors is reflected in the soil. The Permian rocks, which are the oldest of the parent materials in Dewey County, were deposited some 200 million years ago. The present landscapes, however, started to form about the time of the last Kansan glaciers, which account for most of the higher sediments in the county.

The lower terraces of the South Canadian River were laid down during the Illinoian and Wisconsin glaciations, which ended 10,000 to 11,000 years ago. Thus, Dewey County has few, if any, soils more than 20,000 years old, but most of the mature soils are more than 10,000 years old.

Considerable time is required for a mature soil to develop. The length of time depends on the combined action and intensity of the other soil-forming factors. Soils develop slowly in dry climates under sparse vegetation. They develop more rapidly in moist climates under dense vegetation. Soils of Dewey County have developed at a moderate rate. They range in age from youthful, or immature, to old, or mature.

The oldest, or most mature, soils are in the eastern part of the county. These soils formed under oak or under oak that was later replaced by grass. The fine-textured soils that formed under grass in the central part of the county are about the same age as the soils in the eastern part. The soils of these two groups have well-defined horizons of about the same thickness. The youngest, or most immature, soils are the weakly stabilized dune sands and the recent alluvium. In these soils, evident horizons have not been formed, and there is little difference between the A horizon and the parent material. The other soils in the county range in age between these two extremes.

Classification and Morphology of Soils

Soils are classified into categories progressively more inclusive. In the United States a system of classification that consists of six categories is used. Beginning with the most inclusive, these categories are the order, suborder, great soil group, family, series, and type.

There are three soil orders, but thousands of soil types. The suborder and family categories have not been fully developed and, thus, have been little used. Attention has been directed largely toward great soil groups, series, and types.

The three orders are the zonal, the intrazonal, and the azonal. The zonal order consists of soils that have evident, genetically related horizons that reflect the dominant influence of climate and living organisms in their formation. The intrazonal order consists of soils that have evident, genetically related horizons that reflect the dominant influence of parent material or topography over the effects of climate and living organisms. The azonal order consists of soils that lack distinct, genetically related horizons because of one or more of the following: youth of parent material, resistance of parent material to change, or steep topography.

Each class in the third category from the top of the classification system—a great soil group—consists of several soil series that have the same general sort of profile. Soils of different series within the same great soil group have, however, significantly different parent material and relief, or they differ in degree of development.

Soil series and soil types are defined and discussed in the section "How This Survey Was Made." In table 11, the soil series of Dewey County are arranged in soil orders and great soil groups. Following the table, there is a discussion of the great soil groups and the soil series in each great soil group. Some relationships of the series are also discussed, and a representative profile of each soil series is described.

TABLE 11.—*Classification of series by orders and great soil groups, and some of the factors that affect morphology*

ZONAL ORDER

Great soil group and series	Parent material	Slope range	Native vegetation	Major associated series
Chestnut soils:		*Percent*		
Holdrege	Alluvium on high river terraces	0 to 3	Tall and mid grasses	Tipton, Enterprise, and Miles.
Lofton	Old, high Pleistocene alluvium	0 to 1	Mid grasses	Miles, Holdrege, and St. Paul.
Pratt	Sandy eolian mantles	[1] 1 to 12	Tall grasses and sand sage.	Miles and Carwile.
Pratt, heavy subsoil variant.	Sandy eolian material, or sandy alluvium reworked by wind.	1 to 12	Post oak, shinnery oak, and tall grasses.	Nobscot and Carwile.
Tipton	Alluvial or eolian material on low river terraces.	0 to 1	Tall grasses	Enterprise and Holdrege.
Reddish Chestnut soils:				
Carey	Calcareous Permian sandstone, shale, or packsand.	1 to 8	Tall and mid grasses	Quinlan, Woodward, and St. Paul.
Dill	Noncalcareous Permian packsand.	1 to 8	Tall grasses	Miles; Nobscot; and Pratt, heavy subsoil variant.
Miles	Moderately sandy sediments	0 to 8	Tall grasses	Pratt, Carwile, and Nobscot.
St. Paul	Calcareous Permian sandstone or shale, and shallow silty mantles.	0 to 5	Mid and tall grasses	Quinlan, Woodward, and Carey.
Brunizems:				
Farnum	Old noncalcareous Pleistocene alluvium.	0 to 1	Tall grasses	Miles; Carwile; Pratt, heavy subsoil variant; and Nobscot.

See footnote at end of table.

TABLE 11.—*Classification of series by orders and great soil groups, and some of the factors that affect morphology*.—Continued

ZONAL ORDER—Continued

Great soil group and series	Parent material	Slope range	Native vegetation	Major associated series
Red-Yellow Podzolic soils:		*Percent*		
Nobscot	Sandy eolian material or sandy alluvium reworked by wind.	3 to 12	Post oak and shinnery oak.	Pratt, heavy subsoil variant, and Carwile.

INTRAZONAL ORDER

Great soil group and series	Parent material	Slope range	Native vegetation	Major associated series
Planosols:				
Carwile	Old, high alluvium or eolian material.	0 to 2	Water grasses and tall grasses.	Pratt, Nobscot, Brownfield, and Miles.

AZONAL ODER

Great soil group and series	Parent material	Slope range	Native vegetation	Major associated series
Alluvial soils:				
Brazos	Mixed recent alluvium	0 to 1	Tall grasses	Lincoln and Enterprise.
Canadian	Nonreddish mixed recent alluvium.	0 to 1	Tall grasses	Lincoln, Enterprise, and Tipton.
Lincoln	Mixed recent alluvium	0 to 1	Tall grasses	Wann, Spur, and Alluvial land.[2]
Port	Silty red-bed alluvium	0 to 1	Tall grasses	Yahola.
Spur	Mixed calcareous alluvium	0 to 1	Tall grasses	Canadian and Wann.
Wann	Nonreddish loamy and sandy alluvium.	0 to 1	Tall grasses	Lincoln and Alluvial land.[2]
Yahola	Sandy calcareous red-bed alluvium.	0 to 2	Tall grasses	Lincoln and Canadian.
Lithosols:				
Vernon	Calcareous Permian claystone	3 to 20	Short grasses	Quinlan and Woodward.
Regosols:				
Enterprise	Neutral to calcareous eolian sand or silt, or silty alluvium.	0 to 20	Tall grasses	Tipton and Holdrege.
Quinlan	Calcareous Permian sandstone	3 to 20	Mid grasses	Woodward, Carey, and St. Paul.
Tivoli	Neutral or calcareous eolian sand.	3 to 25	Tall grasses, sand sage, and brush.	Lincoln and Pratt.
Woodward	Calcareous Permian sandstone or shale.	0 to 8	Tall and mid grasses	Quinlan, Carey, and St. Paul.

[1] Undulating and duned. [2] Alluvial land is a land type, not a soil series, and is not classified in a great soil group.

Chestnut soils

Chestnut soils of Dewey County have a brown or darker colored, granular surface horizon that is slightly acid to mildly alkaline. They have a lighter colored, prismatic to blocky B horizon that grades into parent material that generally is reddish in color. Lime has accumulated at a depth of 1 to 4 feet, the average depth to which rainwater penetrates. The lower part of the solum generally is calcareous. The parent material consists of old Pleistocene alluvium and Quaternary sand.

Chestnut soils formed under mixed grasses in a subhumid to semiarid, temperate to cool-temperate climate.

The Chestnut soils of Dewey County have been subjected to calcification under grass and to weak leaching under grass and woody plants. Thus, there has been a removal of calcium carbonate from the surface horizon, a translocation of clay and colloidal organic matter, and an accumulation of calcium carbonate in the lower part of the profile.

The Holdrege, Lofton, Pratt, and Tipton series represent this great soil group in Dewey County.

HOLDREGE SERIES.—The Holdrege series consists of deep, dark-colored, well-drained soils that developed in calcareous, silty or loamy alluvial or eolian material under a cover of tall grasses. These soils have a dark-colored A horizon of loam or silt loam and a brown or dark-brown, prismatic B horizon of loam or clay loam. They are on level to gently sloping terraces along the North Canadian and South Canadian Rivers, or on uplands bordering these rivers. Extensive areas are on the Quaternary deposits of the JV and Trail Flats.

Holdrege soils are more sandy and less well developed than St. Paul soils; less red and more silty than Miles soils; more silty than Pratt soils; less red than Carey soils; and less calcareous and more well developed than the associated Enterprise soils. They are associated with Tipton soils, but Tipton soils have a water table within 15 feet of the surface, and their substratum is mottled in some places.

Typical profile of a Holdrege soil in a cultivated field 400 yards west and 100 yards north of the SE. corner of sec. 30, T. 18 N., R. 17 W.

A_{1p}—0 to 7 inches, dark-brown (7.5YR 4/2) silt loam, dark brown (7.5YR 3/2) when moist; moderate, medium, granular structure; slightly hard when dry, friable when moist; noncalcareous; plow boundary.

A_1—7 to 21 inches, dark-brown (7.5YR 4/2) silt loam, dark brown (7.5YR 2.5/2) when moist; strong, medium, granular structure; slightly hard when dry, friable when moist; noncalcareous; numerous worm casts; gradual boundary.

B_{21}—21 to 38 inches, dark-brown (7.5YR 4/2) heavy silt loam, dark brown (7.5YR 3/2) when moist; moderate, medium, prismatic structure breaking to moderate, medium, granular; hard when dry, friable to firm when moist; noncalcareous; numerous worm casts; clay films on prism faces; gradual boundary.

B_{22}—38 to 49 inches, dark-brown (10YR 4/3) light clay loam, dark brown (10YR 3/3) when moist; moderate, medium, prismatic structure breaking to weak granular; hard when dry, firm to friable when moist; noncalcareous; numerous worm casts; clay films on prism faces; gradual boundary.

B_3—49 to 56 inches, brown (10YR 5/3) sandy clay loam; dark brown (10YR 4/3) when moist; moderate, medium, granular structure; hard when dry, friable when moist; calcareous; many coarse sand grains; many wheat roots to this depth.

Range in characteristics.—Soil types include loam and silt loam; color of surface layer ranges from brown to very dark grayish brown; color of subsoil is typically brown or dark brown. Calcium carbonate occurs mostly as threads on prism surfaces. Depth of calcareous material ranges from 30 to 60 inches. Depth to water table ranges from 10 to 150 feet.

Topography.—Level to gently sloping river terraces or mantled uplands.

Drainage.—Medium runoff; medium internal drainage.

Lofton Series.—The Lofton series consists of deep, somewhat poorly drained soils that have a compact, clayey subsoil. These soils developed in old, high Pleistocene alluvium under a cover of mixed native grasses. They occur in weakly concave areas among Tertiary or old Quaternary deposits in the western part of the county. The A horizon is thin. The B horizon is massive to blocky in structure and is extremely hard when dry.

Lofton soils are more gray and more clayey than St. Paul and Tipton soils. They are more gray than the associated Holdrege and Miles soils, and they have a less sandy subsoil. They are less deep to the B_2 horizon than Farnum soils, and they are more clayey but less silty.

Typical profile of a Lofton soil in a nearly level cultivated field 0.3 mile west and 50 feet north of the SE. corner of sec. 1, T. 19 N., R. 20 W.

A_1—0 to 6 inches, dark-gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) when moist; moderate, fine and medium, granular structure; slightly hard when dry, firm when moist; few pores; noncalcareous; clear boundary.

B_2—6 to 20 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; moderate, coarse, blocky structure; very firm when moist, extremely hard when dry; scattered gravel and coarse sand grains; gradual boundary.

B_3—20 to 30 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; weak, coarse, blocky structure to massive; very firm when moist, extremely hard when dry; slightly calcareous; scattered gravel and ferromagnesium concretions; gradual boundary.

C—30 to 42 inches, gray (10YR 5/1) sandy clay, dark gray (10YR 4/1) when moist; massive; very firm when moist, very hard when dry; calcareous; few calcium carbonate films and some rust stainings.

Range in characteristics.—Color of the surface layer ranges from very dark gray to dark brown; color of the subsoil ranges from black to dark gray. The subsoil is faintly mottled in some places, and in others it contains a B_{ca} horizon, but these factors are not considered as distinguishing characteristics. The surface layer is less than 16 inches thick.

Topography.—Concave uplands; slope of less than 1 percent.

Drainage.—Very slow surface runoff; slow internal drainage.

Pratt Series.—The Pratt series consists of slightly acid, well-drained, weakly developed sandy soils that formed in old eolian material. These soils occur on undulating, hummocky, or duned uplands within areas of Tertiary or Quaternary deposits. Extensive areas are in the vicinity of Vici.

The A horizon is about 12 inches of dark-colored sandy loam or loamy fine sand. The B horizon is brown or dark-brown sandy loam or loamy fine sand. The C horizon is yellowish-brown to reddish-brown loamy fine sand. There is no zone of accumulated lime.

Pratt soils are more acid and more well developed than Enterprise soils. They are less red than the associated Miles soils, and they have a less clayey subsoil. They are less sandy and more well developed than Tivoli soils. They are associated with the somewhat poorly drained Carwile soils, which have a mottled, clayey subsoil. Pratt soils, heavy subsoil variant, are more clayey than other Pratt soils, and they have a more well developed B horizon.

Typical profile of a Pratt soil in a hummocky pasture 50 feet south of the NE. corner of the NW¼ sec. 8, T. 19 N., R. 20 W.

A_1—0 to 11 inches, brown (10YR 5/3) loamy fine sand, dark brown (10YR 3/3) when moist; weak, medium and fine, granular structure; slightly hard when dry, very friable when moist; noncalcareous; pH 6.5; clear boundary.

B_2—11 to 31 inches, pale-brown (10YR 6.5/3) loamy fine sand; slightly more sticky than A_1; brown (10YR 4/3) when moist; weak, coarse, prismatic structure breaking to granular; slightly hard when dry, very friable when moist; noncalcareous; pH 6.5; gradual boundary.

C—31 to 60 inches, pale-brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) when moist; structureless; loose when moist and when dry; noncalcareous; pH 6.5; krotovinas throughout profile.

Range in characteristics.—Soil types include fine sandy loam and loamy fine sand. Color of surface layer ranges from dark grayish brown to brown. The B horizon is dark brown to brown in color and fine sandy loam to loamy fine sand in texture. The C horizon is reddish yellow, yellowish brown, or pale brown. The soil is more red throughout the profile at places where it contacts the red beds.

Topography.—Uneven sandy uplands; nearly level to dunelike. Small gravel knobs in a few areas.

Drainage.—Slow to medium runoff; rapid internal drainage.

Pratt, Heavy Subsoil Variant.—This is a group of well-developed sandy soils that formed in sandy material deposited or reworked by wind. These soils occur around Webb and Oakwood. The topography is gently sloping to steeply sloping. The parent material consists of old

terrace deposits of Quaternary age. The soils developed under tall grasses, but they presumably have been modified by woody vegetation. The present native cover ranges from savanna-type vegetation to a forest of shinnery oak and post oak. Soils that have never been cultivated have a thick, dark-colored A_1 horizon underlain by a lighter colored, more sandy A_{12} horizon. The B_2 horizon is sandy clay loam that has pronounced structure. There is no zone of accumulated lime.

Pratt soils, heavy subsoil variant, have a much more clayey and more well developed B horizon than other soils of the Pratt series. They have a more sandy A horizon than Miles soils, and they are less silty than Enterprise soils. They are associated with Nobscot soils, which have a more sandy A_1 horizon and a less well developed B_2 horizon.

Typical profile of a Pratt soil, heavy subsoil variant, in a native pasture 0.2 mile south and 15 yards west of the NE. corner of sec. 11, T. 18 N., R. 15 W.

A_{11}—0 to 12 inches, grayish-brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) when moist; weak, medium, granular structure; soft when dry, friable when moist; medium acid; clear boundary.

A_{12}—12 to 25 inches, pale-brown (10YR 6/3) fine sand, brown (10YR 4/3) when moist; structureless; loose when moist and when dry; medium acid; clear boundary.

B_2—25 to 39 inches, yellowish-brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) when moist; moderate, coarse, prismatic structure; hard when dry, firm when moist; medium acid; gradual boundary.

B_3—39 to 58 inches, yellowish-brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) when moist; moderate, coarse, prismatic structure; hard when dry, firm when moist; medium acid; gradual boundary.

C—58 to 72 inches, reddish-yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 5/8) when moist; structureless; soft when dry, very friable when moist; slightly acid; contains lenses of very pale brown fine sand.

Range in characteristics.—The A_1 horizon is brown to grayish brown. The B horizon is brown or yellowish brown, and its texture is sandy clay loam or heavy sandy loam. The thickness of A_{11} and A_{12} horizons varies slightly. The reaction ranges from pH 5.5 to pH 6.5.

Topography.—Gently sloping to steeply sloping sandy uplands.

Drainage.—Slow to medium runoff; medium internal drainage.

TIPTON SERIES.—The Tipton series consists of deep, dark-colored, well-drained soils that developed in calcareous silty alluvial or eolian material under a cover of tall grasses. These soils occur on low, level terraces adjacent to the North Canadian and South Canadian Rivers. The water table is within 15 feet of the surface and furnishes a good supply of water for deep-rooted plants.

The surface layer is deep and is underlain by dark-brown silt loam to light silty clay loam.

Tipton soils are more clayey and more well developed than the associated Enterprise soils. They are somewhat less clayey than St. Paul soils and lack the thick B_1 horizon. They are less red and more silty than Miles soils, and they are less red than Carey soils. They are associated with Holdrege soils, which have a much deeper water table and are generally free of mottling in the substratum.

Typical profile of a Tipton soil in a cultivated field 100 yards west and 200 yards south of the NE. corner of sec. 3, T. 19 N., R. 16 W.

A_{1p}—0 to 7 inches, dark-brown (10YR 4/3) silt loam, dark brown (10YR 3/3) when moist; weak, medium, granular structure; slightly hard when dry, friable when moist; noncalcareous; plow boundary.

A_1—7 to 20 inches, very dark grayish-brown (10YR 3/2) silt loam, very dark brown (10YR 2/2) when moist; moderate, medium, granular structure; slightly hard when dry, friable when moist; noncalcareous; numerous worm casts; gradual boundary.

B_2—20 to 42 inches, dark-brown (7.5YR 3/2) silty clay loam, very dark brown (7.5YR 2/2) when moist; strong, coarse, prismatic structure breaking inconsistently to coarse, subangular blocky: hard when dry, firm to friable when moist; noncalcareous; numerous worm casts; clay films on prism faces; gradual boundary.

B_3—42 to 51 inches, dark-brown (7.5YR 4/4) light clay loam, dark brown (7.5YR 3/4) when moist; moderate, coarse, prismatic structure; hard when dry, firm when moist; calcareous; threads of carbonate on prism faces; gradual boundary.

C—51 to 72 inches +, brown (7.5YR 5/4) heavy loam; brown (7.5YR 5/4) when moist; weak, coarse, prismatic structure; hard when dry, friable when moist; calcareous; many threads of carbonate; scattered gravel; water table at a depth of about 13 feet, according to measure in an area well.

Range in characteristics.—The profile ranges from brown to very dark grayish brown. Calcium carbonate occurs in the lower horizons, mostly as threads on prism faces. The water table is within 15 feet of the surface.

Topography.—Level and nearly level river terraces.

Drainage.—Medium runoff; medium internal drainage.

Reddish Chestnut soils

Reddish Chestnut soils have a dark-brown, granular surface horizon that is mildly alkaline. This horizon is as much as 2 feet thick. It is underlain by finer textured reddish-brown material, which overlies a zone of accumulated lime. The parent material is either residuum from the red beds or a thin layer of windblown or alluvial material over the red beds.

Reddish Chestnut soils formed in a semiarid, warm-temperate climate, predominantly under tall native grasses.

This great soil group is represented in Dewey County by soils of the Carey, Dill, Miles, and St. Paul series.

CAREY SERIES.—This series consists of deep, well-drained, reddish-brown silty soils that developed under grass in residuum from calcareous sandstone, shale, or packsand of the Permian Red Beds. These soils occur on gently sloping to strongly sloping, convex uplands and are extensive in the vicinity of Cestos, Putnam, and Leedey.

The A horizon typically is friable, reddish-brown silt loam. The B horizon is friable, prismatic, reddish-brown silt loam or clay loam that is moderately permeable. The lower part of the B horizon and the upper part of the C horizon are redder than the horizons above and are calcareous. The C horizon consists of red-bed material that weathers rapidly. There are numerous worm casts in the lower part of the A horizon and in the B horizon.

Carey soils occur in broad areas in association with St. Paul, Quinlan, and Woodward soils. They are more red than St. Paul soils, but they are not so dark colored in the

upper horizons, and they have less clay in the subsoil. They have a less red surface layer than Woodward and Quinlan soils, and they have a well-developed B horizon, which those soils lack. The surface layer and subsoil of the Carey soils are redder than those of the Tipton and Holdrege soils.

Analytical data for Carey silt loam are shown in a table in the soil survey report for Roger Mills County, Okla.[11]

Typical profile of a Carey soil in a cultivated field along U.S. Highway No. 60, 170 yards west and 10 yards south of the NE. corner of the NW¼ sec. 9, T. 19 N., R. 18 W.

A_{1p}—0 to 6 inches, reddish-brown (5YR 4/4) light silt loam to loam, dark reddish brown (5YR 3/4) when moist; weak, medium, granular structure; slightly hard when dry, friable when moist; surface crusted; noncalcareous; plow boundary.

A_1—6 to 20 inches, reddish-brown (5YR 4/3) light silt loam, dark reddish brown (5YR 3/3) when moist; moderate, medium, granular structure; slightly hard when dry, friable when moist; numerous worm casts; noncalcareous; gradual boundary.

B_2—20 to 38 inches, reddish-brown (5YR 4/4) heavy silt loam, dark reddish brown (5YR 3/4) when moist; moderate, medium to coarse, prismatic structure breaking to weak, granular; hard when dry, friable when moist; numerous worm casts; many roots; noncalcareous; gradual boundary.

B_3—38 to 52 inches, red (2.5YR 5/6) heavy loam, red (2.5YR 4/6) when moist; moderate, medium to coarse, prismatic structure breaking to weak, granular; hard when dry, friable when moist; many roots; calcareous; scattering of calcium carbonate fragments and, in lower part, bits of sandstone; gradual boundary.

C—52 to 60 inches, light-red (2.5YR 6/8) loam, red (2.5YR 5/8) when moist; calcareous; highly weathered, fine-grained sandstone; many roots.

Range in characteristics.—The A horizon is loam or silt loam; it ranges from 10 to 22 inches in thickness and averages about 16 inches. In color it ranges mostly from reddish brown to dark reddish brown, but it may be darker where it contacts the St. Paul soils. The subsoil ranges from heavy loam to clay loam but generally is heavy silt loam; this layer is principally reddish brown, but it is red in the lower part. The carbonate horizon is ill-defined and is lacking in many places. Calcareous material is 30 inches to 6 feet from the surface.

Topography.—Gently sloping to strongly sloping uplands.

Drainage.—Medium runoff; medium internal drainage.

Dill Series.—The Dill series consists of reddish, slightly acid, weakly developed sandy soils that formed in residuum from noncalcareous, fine-grained Permian packsand. These soils developed under a cover of native grasses but have no zone of accumulated lime. They occur on level to strongly sloping uplands in the eastern part of the county.

The surface layer is reddish-brown, loose to very friable fine sandy loam. The subsoil is red, friable, slightly acid fine sandy loam. The parent material is red or light-red, slightly acid, weakly consolidated packsand.

Dill soils are similar to Woodward and Quinlan soils, but they are noncalcareous and have a weakly developed B horizon. They are less clayey in the B_2 horizon and more red in the surface layer than Miles soils. They are more red than Pratt soils. They are less clayey than Carey soils, and they lack a zone of accumulated lime.

Typical profile of Dill fine sandy loam in a cultivated field 0.25 mile south and 25 yards east of the NW. corner of sec. 25, T. 18 N., R. 14 W.

A_{1p}—0 to 7 inches, reddish-brown (5YR 5/4), winnowed fine sandy loam, dark reddish brown (5YR 3/4) when moist; structureless; loose when dry, very friable when moist; noncalcareous; plow boundary.

A_1—7 to 13 inches, reddish-brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) when moist; weak, medium, granular structure; soft when dry, very friable when moist; noncalcareous; clear boundary.

B_2—13 to 27 inches, red (2.5YR 5/6) fine sandy loam, dark red (2.5YR 3/6) when moist; moderate, medium, prismatic structure; slightly hard when dry, friable when moist; noncalcareous; worm casts; gradual boundary.

B_3—27 to 42 inches, red (2.5YR 5/6) fine sandy loam, red (2.5YR 4/6) when moist; weak, moderate, prismatic structure to structureless; soft when dry, very friable when moist; noncalcareous; 35 percent of lower part is weakly consolidated packsand pebbles; diffuse boundary.

C—42 to 48 inches +, red (2.5YR 5/6), weakly consolidated, noncalcareous packsand, red (2.5YR 4/6) when moist.

Range in characteristics.—The surface layer ranges from winnowed sandy loam to fine sandy loam. The solum is 25 to 45 inches thick in noneroded areas. In depressions overwashed with alluvium, the surface layer is thicker and darker colored. Where these soils border sandy terraces, the surface layer is somewhat more sandy and the colors are more yellowish.

Topography.—Level to strongly sloping, moderately sandy red-bed uplands.

Drainage.—Slow to moderate runoff; medium to rapid internal drainage.

Miles Series.—The Miles series consists of deep, well-developed sandy soils that have a friable subsoil of reddish sandy clay loam. These soils developed in uplands under a cover of native grasses in noncalcareous, moderately sandy sediments that, in places, have been reworked by wind. They occur in level to strongly sloping areas on old Quaternary and Tertiary deposits.

The surface layer is brown, very friable fine sandy loam. The subsoil is reddish-brown, well-developed, firm sandy clay loam. The parent material generally is stratified reddish or yellowish sandy loam that is neutral in reaction.

Miles soils have a more red and more clayey subsoil than Pratt soils; a more sandy and more red subsoil than Farnum soils; and a less red surface layer and a more clayey subsoil than Dill soils. They have a more shallow and less sandy A_1 horizon than Nobscot soils and the Pratt soils, heavy subsoil variant.

Typical profile of Miles fine sandy loam in a cultivated field 180 feet east and 60 feet north of the NW. corner of the SW¼ sec. 3, T. 19 N., R. 20 W.

A_{1p}—0 to 5 inches, brown (10YR 5/3), slightly winnowed fine sandy loam, dark brown (10YR 3/3) when moist; weak, fine, granular structure; loose when dry, very friable when moist; noncalcareous; plow boundary.

A_1—5 to 8 inches, brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) when moist; weak, medium, granular structure; slightly hard when dry, friable when moist; noncalcareous; worm casts; gradual boundary.

[11] Burgess, D. L., Nicholas, J. D., and Henson, O. G. soil survey, Roger Mills County, Okla. U.S. Dept. Agr. Soil Survey Ser. 1959.

B_2—8 to 25 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) when moist; moderate, coarse, prismatic structure; hard when dry, firm when moist; noncalcareous; few worm casts; porous; gradual boundary.

B_3—25 to 46 inches, yellowish-red (5YR 5/6) light sandy clay loam, yellowish red (5YR 3.5/6) when moist; weak, coarse, prismatic structure; hard when dry, firm to friable when moist; noncalcareous; many roots; porous; gradual boundary.

C—46 to 75 inches, reddish-yellow (5YR 6/8) sandy loam, yellowish red (5YR 5/8) when moist; stratified with loamy sand and sandy loam, and more sandy with depth; structureless; loose when dry and when moist; noncalcareous; few marble-sized pebbles.

Range in characteristics.—In texture, the A horizon ranges from winnowed sandy loam to fine sandy loam, and the B_2 horizon, from heavy fine sandy loam to light clay loam. The B_2 horizon may contain patchy clay films. The surface layer is brown or dark brown; the B_2 horizon is predominantly reddish brown but includes some more yellow hues; and the B_3 and C horizons are yellowish red or reddish yellow.

Topography.—Level to strongly sloping, moderately sandy uplands; a few gravel knobs.

Drainage.—Slow to medium runoff; medium internal drainage.

St. Paul Series.—The St. Paul series consists of deep, dark-colored, well-developed soils that have a fairly compact, moderately slowly permeable, blocky subsoil. These soils formed principally in residuum from calcareous sandstone or shale of the Permian Red Beds, but some formed in transported material. They occur in the vicinity of Putnam, Seiling, and Leedey, in level to sloping red-bed areas or in areas that have a thin mantle over the red beds. Where these soils developed in transported material, dark-colored buried soils are common.

The A horizon is dark-colored, granular silt loam. The B_1 horizon is dark-colored, friable, subangular blocky silty clay loam. The B_2 horizon is very firm, blocky, reddish silty clay loam that becomes more reddish with depth. The soils are porous, and worm casts are common.

St. Paul soils are more clayey than Holdrege soils, and they are stronger in structure. They are less clayey and more permeable than Lofton soils. The St. Paul soils that developed in residuum are members of the red-bed catena that includes Carey, Woodward, and Quinlan soils, in order of decreasing development. St. Paul soils are more brown in the A horizon and more clayey in the B horizon than Carey soils.

Analytical data for St. Paul silt loam are shown in a table in the soil survey report for Roger Mills County, Okla.[12]

Typical profile of a St. Paul soil in a cultivated field 520 feet west and 65 feet south of the intersection of the county and farm home roads in the SW¼ sec. 32, T. 19 N., R. 17 W.

A_{1p}—0 to 6 inches, dark-brown (7.5YR 4/2) silt loam, dark brown (7.5YR 3/2) when moist; weak, fine, granular structure; slightly hard when dry, friable when moist; noncalcareous; plow boundary.

A_1—6 to 13 inches, dark-brown (7.5YR 3/2) heavy silt loam, very dark brown (7.5YR 2/2) when moist; moderate, fine, granular structure; slightly hard when dry, friable when moist; numerous worm casts; gradual boundary.

B_1—13 to 22 inches, dark-brown (7.5YR 4/2) light silty clay loam, dark brown (7.5YR 3/2) when moist; moderate, medium, subangular blocky structure; hard when dry, firm when moist; numerous worm casts; patchy clay films; porous; noncalcareous; gradual boundary.

B_{21}—22 to 29 inches, dark reddish-gray (5YR 4/2.5) silty clay loam, dark reddish brown (5YR 3/2) when moist; moderate, medium, blocky structure; hard when dry, firm when moist; worm casts; continuous clay films; porous; noncalcareous; gradual boundary.

B_{22}—29 to 43 inches, reddish-brown (5YR 4/3) heavy silty clay loam, dark reddish brown (5YR 3/3) when moist; strong, medium, blocky structure; very hard when dry, very firm when moist; continuous clay films; fairly porous; noncalcareous; gradual boundary.

B_3—43 to 52 inches, reddish-brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) when moist; moderate, medium, subangular blocky structure; hard when dry, very firm when moist; patchy clay films; fairly porous; calcareous; many small roots; gradual boundary.

C—52 to 75 inches, yellowish-red (5YR 5/6) clay loam, yellowish red (5YR 4/6) when moist; structureless; friable when moist; calcareous silty red beds.

Range in characteristics.—The surface layer is silt loam or clay loam, and the subsoil is clay loam to silty clay. The color ranges from dark brown to very dark brown in the A horizon and is generally reddish brown in the B horizon. The upper part of the B horizon is dark reddish gray in many places, and in some places the entire B horizon is dark brown. The parent material is typically yellowish red, but its color varies widely where buried soils occur. Contact between this soil and the Carey soil is wide in many places. In a few areas that are nearly level, the surface layer is 35 inches thick.

Topography.—Level to sloping uplands.

Drainage.—Medium runoff; slow internal drainage.

Brunizems

Brunizems have a thick, dark-colored, granular A horizon that is acid in reaction and high in content of organic matter. The B horizon is brownish in color and may or may not be mottled. The parent material, which is at a depth of 2 to 5 feet, is lighter colored than the A and B horizons.

Brunizems formed in a relatively humid, temperate climate, typically under tall grasses. In Dewey County, however, the native vegetation included a moderate amount of oak.

The Brunizems of Dewey County formed on nearly level terraces of Pleistocene age in the eastern part of the county, from sediments that are not high in lime.

This great soil group is represented in the county by the Farnum series.

Farnum Series.—The Farnum series consists of deep, dark-colored, moderately sandy soils that have a fairly compact, blocky, slowly permeable subsoil. These soils developed in noncalcareous old alluvium and in old windworked alluvium. They occur on nearly level, weakly defined upland terraces deposited by a Pleistocene river. The native vegetation was predominantly tall grasses.

The A_1 horizon is dark-brown fine sandy loam. The B_2 horizon is gray to dark grayish-brown heavy silty clay loam or heavy clay loam. The C horizon is deep and is commonly sandy loam. It varies in color.

Farnum soils are more clayey in the B_2 horizon and more acid in the lower part of the B horizon than Holdrege soils. They have a thicker A_1 horizon and a less

[12] See footnote 10, p. 62.

red, more clayey B_2 horizon than Miles soils. Farnum soils are less clayey in the A horizon than St. Paul and Lofton soils, and they are less calcareous in the lower part of the solum.

Typical profile of a Farnum soil in a cultivated field 35 yards north and 10 yards west of the SE. corner of sec. 12, T. 18 N., R. 15 W.

A_{1p}—0 to 6 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft when dry, friable when moist; noncalcareous; plow boundary.

A_1—6 to 20 inches, dark-brown (10YR 4/3) very fine sandy loam, dark brown (10YR 3/3) when moist; moderate, medium, granular structure; slightly hard when dry, friable when moist; noncalcareous; worm casts; gradual boundary.

B_1—20 to 32 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; moderate, medium, subangular blocky structure; hard when dry, firm when moist; noncalcareous; patchy clay films; porous; noncalcareous; gradual boundary.

B_2—32 to 52 inches, gray (10YR 5/1) heavy clay loam, very dark gray (10YR 3/1) when moist; strong, medium, blocky structure; very hard when dry, very firm when moist; noncalcareous; continuous clay films; gradual boundary.

B_3—52 to 60 inches, pale-brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) when moist; weak, coarse, prismatic structure; slightly hard when dry, friable when moist; noncalcareous; 10 to 15 percent of the material in this layer is mottled with rust and light gray; the light-gray spots are sand.

Range in characteristics.—In places, the A horizon grades to light loam at a depth of about 12 inches. The texture of the subsoil ranges from heavy loam in the B_1 horizon to light silty clay in the B_2 horizon. The B_3 horizon is generally sandy clay loam. The subsoil ranges from dark brown to dark gray in the upper part, and from light brownish gray to light yellowish brown in the lower part. Small iron concretions are found throughout the B horizon. In a few places the slope is as much as 2 percent. The plow layer is loamy fine sand at some contacts with sandy soils. The lower part of the subsoil is reddish where the mantle of alluvium is thin over red beds.

Topography.—Nearly level upland terraces.

Drainage—Slow runoff; slow internal drainage.

Red-Yellow Podzolic soils

These soils have a thin surface cover of litter and acid humus; a thin organic-mineral horizon; a thicker, light-colored, leached A_2 horizon; a thick, red, yellowish-red, or yellowish-brown B horizon that shows some accumulation of clay and sesquioxides; and a relatively sandy C horizon. The entire profile is slightly to moderately acid. Red-Yellow Podzolic soils occur in the vicinity of Oakwood and Webb, chiefly on Old Pleistocene and Pliocene sandy terraces.

Soils of this group form in a humid, warm-temperate climate, and this indicates that rainfall in this county was higher than it is now. Typically, the native vegetation on soils of this group was forest, but in Dewey County tall grasses grew in the open areas.

Only the Nobscot series represents this great soil group in Dewey County.

NOBSCOT SERIES.—The Nobscot series consists of deep, well-drained, very sandy soils that formed in sandy material deposited or reworked by wind. These soils developed under forest-type vegetation and have no zone of accumulated lime. Extensive areas occur on sloping to very steeply sloping Quaternary deposits in the vicinity of Oakwood and Webb. These areas have a cover of shinnery oak and post oak.

The clearly defined A_1 horizon is granular to single-grained, grayish-brown loamy fine sand or fine sand. The A_2 horizon is bleached, structureless, very pale brown fine sand. The B_2 horizon is reddish-yellow or yellowish-red loamy sand that contains bands of fine sand to sandy clay loam.

Nobscot soils generally are more sandy in the A horizon and less well developed in the B_2 horizon than the associated Pratt soils. Miles and Pratt soils have no A_2 horizon.

Analytical data for Nobscot fine sand are shown in a table in the soil survey report for Roger Mills County, Okla.[13]

Typical profile of a Nobscot soil in native woodland pasture 250 yards north and 160 yards west of the SE. corner of sec. 17, T. 17 N., R. 14 W.

A_1—0 to 7 inches, grayish-brown (10YR 5/2) fine sand, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure to single grain; loose when dry, very friable when moist; pH 6.2: clear boundary.

A_2—7 to 34 inches, very pale brown (10YR 7/3) fine sand, brown (10YR 5/3) when moist; structureless; loose when moist and when dry; noncalcareous; pH 6.0; clear boundary.

B_2—34 to 58 inches, reddish-yellow (7.5YR 7/6) loamy sand, strong brown (7.5YR 5/6) when moist; structureless; hard when dry, friable when moist; pH 4.5; irregular, discontinuous bands, 1/8 inch to 8 inches thick, of yellowish-red (5YR 5/6) fine sandy loam to sandy clay loam yellowish red (5YR 4/6) when moist; gradual boundary.

C—58 to 90 inches, reddish-yellow (5YR 6/8) fine sand, yellowish red (5YR 5/8) when moist; structureless; loose when moist and when dry; pH 5.5; bands of yellowish-red fine sandy loam less than 1 inch thick.

Range in characteristics.—The A_1 horizon is fine sand or loamy fine sand in texture and usually dark grayish brown or grayish brown in color. In cultivated areas, the color ranges from brown to pale brown. Bands in the B_2 horizon range from fine sand to sandy clay loam in texture and are usually yellowish red in color. The A horizon ranges from 14 to 38 inches in thickness but usually is more than 20 inches thick.

Topography.—Sloping to very steeply sloping sandy uplands.

Drainage.—Slow runoff; rapid to medium internal drainage.

Planosols

Planosols have an eluviated surface horizon and a sharply contrasting B horizon that is more strongly illuviated, cemented, or compacted than the B horizon in associated soils. In Dewey County, Planosols formed in depressions that receive runoff from surrounding areas. These soils have a grayish-brown, slightly acid, sandy A horizon and a mottled, compact, heavy B horizon.

Planosols formed in a humid or subhumid climate, typically under grass or forest. In Dewey County, the original vegetation consisted of tall grasses, sedges, and some oaks. The parent material is alluvium of the old Pliocene or Pleistocene terraces.

[13] See footnote 10, p. 62.

The Carwile soils are the only Planosols in Dewey County.

CARWILE SERIES.—The Carwile series consists of somewhat poorly drained soils that have a mottled, compact subsoil of sandy clay. These soils developed in alluvial or eolian material from late Tertiary and old Quaternary deposits. They occur mainly in broad, concave areas in the northeastern part of the county, but smaller, depressed areas occur throughout the sandy uplands. Runoff from higher areas ponds in these low places for periods of several months.

The surface layer is commonly dark colored and granular. It varies in texture. The subsoil is mottled sandy clay. It is prismatic in structure and is extremely hard when dry.

Carwile soils have a heavier, more mottled B_2 horizon and generally a more clayey A horizon than Pratt and Miles soils. They differ from Nobscot soils and Pratt soils, heavy subsoil variant, in having a more clayey and more mottled B_2 horizon.

Typical profile of Carwile fine sandy loam in a cultivated field 330 yards north and 100 yards east of the SW. corner of sec. 36, T. 19 N., R. 15 W.

A_{1p}—0 to 6 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, granular structure; slightly hard when dry, friable when moist; noncalcareous; plow boundary.

A_1—6 to 14 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, granular structure; hard when dry, friable when moist; noncalcareous; gradual boundary.

B_1—14 to 22 inches, dark-brown (10YR 4/3) heavy sandy clay loam, dark brown (10YR 3/3) when moist; moderate, medium, prismatic structure; hard when dry, firm when moist; noncalcareous; lower part contains more clay than upper part, and is more like the B_2 horizon in color; gradual boundary.

B_2—22 to 34 inches, light yellowish-brown (10YR 6/4) sandy clay, yellowish brown (10YR 5/4) when moist; mottled with reddish brown and streaked with dark gray; moderate, medium, prismatic structure; extremely hard when dry, very firm when moist; noncalcareous; gradual boundary.

B_3—34 to 48 inches, reddish-brown (5YR 5/4) sandy clay, reddish brown (5YR 4/4) when moist; mottled with pale brown; weak, medium, prismatic structure; very hard when dry, very firm when moist; noncalcareous; gradual boundary.

C—48 to 54 inches, reddish-brown (5YR 5/4) clay loam to sandy clay, reddish brown (5YR 4/4) when moist; 30 percent mottled with distinct, medium and coarse, pale-brown mottles; structureless; very hard when dry, very firm when moist; noncalcareous; this material has been affected by the underlying red beds.

Range in characteristics.—The surface layer ranges from sandy loam to clay loam in texture. The B_2 horizon is heavy sandy clay loam or sandy clay; it ranges from light brownish gray to light yellowish brown in mass color and is mottled (as much as 50 percent) with various yellows, grays, and browns. The surface layer ranges from dark grayish brown to grayish brown. The parent material is mostly noncalcareous, reddish-brown, yellowish-brown, or gray sandy clay or clay loam. The B_1 horizon is free of mottles.

Topography.—Gentle concave slopes on sandy uplands.

Drainage.—Slow to very slow runoff; slow to very slow internal drainage.

Alluvial soils

Alluvial soils consist of transported and recently deposited material. They are characterized by a weak modification, or no modification, of the original material by soil-forming processes. The alluvium may vary widely in texture, and it may be darkened by an accumulation of organic matter.

Because of variations in the depth of entrenched streams and the age of the sediments, Alluvial soils in Dewey County may have weakly developed profiles or may consist of recently deposited material, such as sand. They generally have a brown surface layer and a lighter colored or mottled subsoil. The soils are mostly loams, but the texture ranges from sand to clay. The native vegetation consisted of tall grasses, saltgrasses, sedges, and trees.

This great soil group is represented in Dewey County by the Brazos, Canadian, Lincoln, Port, Spur, Wann, and Yahola soils.

BRAZOS SERIES.—The Brazos series is made up of dark, youthful, well-drained sandy soils that consist of mixed calcareous recent alluvium. These soils occur on low terraces of the North Canadian and South Canadian Rivers but are seldom flooded.

The surface layer is commonly about 20 inches of neutral loamy fine sand that is stained with organic matter. The solum becomes lighter colored, more calcareous, more stratified, and more sandy with depth. The soils developed under a cover of tall native grasses.

Brazos soils are more sandy than Canadian soils; less red and more leached of free carbonates than Yahola soils; less clayey than Wann soils; more leached of free carbonates than Lincoln soils; and more stratified and more sandy than Enterprise soils.

Typical profile of Brazos loamy fine sand 170 yards south and 150 yards east of the NW. corner of sec. 23, T. 18 N., R. 16 W.

A_{1p}—0 to 7 inches, brown (7.5YR 5/4) loamy fine sand, dark brown (7.5 YR 3/4) when moist; structureless; loose when moist and when dry; neutral; plow boundary.

A_1—7 to 20 inches, dark-brown (7.5YR 4/4) loamy fine sand, dark brown (7.5YR 3/4) when moist; weak, fine, granular structure; soft when dry, very friable when moist; neutral; worm casts; gradual boundary.

AC—20 to 40 inches, reddish-yellow (7.5YR 6/6) loamy sand, strong brown (7.5YR 5/6) when moist; structureless; loose when dry or moist; weakly calcareous; weakly stratified; gradual boundary.

C—40 to 55 inches, reddish-yellow (7.5YR 7/6) fine sand, reddish yellow (7.5YR 6/6) when moist; structureless; loose when dry or moist; weakly calcareous; stratified.

Range in characteristics.—In texture the uppermost 24 inches is loamy fine sand. The A_1 horizon is neutral to alkaline in reaction, and in a few areas is reddish brown. In many places the AC horizon is fine sand. In some cultivated fields the surface layer has been winnowed.

Topography.—Nearly level low terraces of the North Canadian and South Canadian Rivers.

Drainage.—Slow runoff; rapid internal drainage.

CANADIAN SERIES.—The Canadian series is made up of dark-colored, friable, moderately sandy, well-drained soils that consist of a mixture of brownish recent alluvium. These soils occur on level, low terraces of the North Canadian and South Canadian Rivers and their larger tributaries, but they are seldom overflowed. Generally, they

are noncalcareous to a depth of about 50 inches and are calcareous below this depth. In Dewey County, loam is the principal soil type. Typically the solum is brown to dark brown, weakly stratified, and neutral. In its lower part it is more sandy, is more strongly stratified, and is calcareous.

Canadian soils are more brown and less calcareous than Yahola soils; less youthful and less calcareous than Wann soils; more stratified and less calcareous than Enterprise soils; less clayey and less well developed than Tipton soils; and less sandy and less alkaline than Brazos soils.

Typical profile of Canadian loam in a cultivated field 350 yards west and 310 yards north of the SE. corner of sec. 5, T. 17 N., R. 15 W.

A_{1p}—0 to 7 inches, brown (10YR 5/3) light loam, dark brown (10YR 3/3) when moist; weak, fine, granular structure; soft when dry, very friable when moist; noncalcareous; plow boundary.

A_1—7 to 29 inches, brown (10YR 4.5/3) loam, dark brown (10YR 3/3) when moist; weak to moderate, medium, granular structure; slightly hard when dry, friable when moist; noncalcareous; numerous worm casts; very porous; gradual boundary.

AC—29 to 38 inches, brown (7.5YR 5/4) heavy loam, dark brown (7.5 YR 3/4) when moist; medium, granular structure drying to weak, coarse, prismatic; slightly hard when dry, friable when moist; noncalcareous; weakly stratified; numerous worm casts; very porous; gradual boundary.

C_1—38 to 52 inches, brown (7.5YR 5/2) loam, dark brown (7.5YR 3/2) when moist; medium, granular structure drying to weak, very coarse, prismatic; slightly hard when dry, friable when moist; noncalcareous; weakly stratified; worm casts; very porous; gradual boundary.

C_2—52 to 72 inches, light-brown (7.5YR 6/4) light loam, brown (7.5YR 4.5/4) when moist; weak, medium, granular structure to structureless; soft when dry, very friable when moist; stratified; calcareous.

Range in characteristics.—The principal texture is loam, but there are a few areas of very fine sandy loam. The surface layer is brown or dark brown, the subsoil is generally brown, and the substratum is light brown to reddish yellow. Depth to calcareous material ranges from 35 to 60 inches. Stratification varies from none in the A horizon to moderate in the subsoil and substratum. In some areas, the surface layer is calcareous; river material has blown onto it or overwash from higher calcareous soils has been deposited.

Topography.—Nearly level low terraces along major streams and their tributaries.

Drainage.—Slow runoff; medium to rapid internal drainage.

LINCOLN SERIES.—The Lincoln series is made up of youthful, calcareous soils that have a shallow surface layer and a very sandy subsoil. These soils occur in large areas on level to billowy flood plains along the North Canadian and South Canadian Rivers and their tributaries. They are subject to flooding and to the deposition of new, generally sandy, material.

These soils are unstable in most areas, and their profile varies greatly from place to place. Commonly, the surface layer is 3 to 6 inches of clay loam or silty clay loam. The underlying material is stratified fine sand. The depth to the water table depends on the flow of streams.

Lincoln soils are more sandy, less stable, and less effectively subirrigated than Alluvial land. The subsoil is sandy throughout and lacks an appreciable amount of mottling. Lincoln soils are more sandy and less coherent than Yahola soils.

Typical profile of Lincoln clay loam in a pasture 0.1 mile west and 0.1 mile north of the SE. corner of sec. 34, T. 20 N., R. 16 W.

A_1—0 to 4 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; moderate, medium, granular structure; hard when dry, friable when moist; calcareous; numerous worm casts; clear boundary.

AC—4 to 10 inches, very pale brown (10YR 7/4), stratified fine sand and loamy fine sand, yellowish brown (10YR 5/4) when moist; structureless; loose when dry, very friable when moist; calcareous; clear boundary.

C—10 to 48 inches, very pale brown (10YR 8/3) fine sand, very pale brown (10YR 7/3 when moist; structureless; loose when dry or moist; calcareous; soil moist from water table, but no free water.

Range in characteristics.—The texture of the surface horizon ranges from loamy sand to silty clay loam. In general, the finer materials are the darker colored. The degree of stratification varies greatly; some profiles have bands of dark-colored clay loam, but generally these bands are not extensive. The profiles are reddish along local tributaries.

Topography.—Nearly level but uneven flood plains.

Drainage.—Slow runoff; rapid to very rapid internal drainage.

PORT SERIES.—The Port series is made up of deep, fertile, well-drained, noncalcareous soils that consist of dark-colored, calcareous, silty red-bed alluvium. These soils occur on the level bottom lands along Barnitz Creek and other tributaries of the Washita River in the southwestern part of the county, but they are seldom overflowed. The original vegetation consisted of native grasses, principally big bluestem, little bluestem, Indiangrass, western wheatgrass, and vine-mesquite. Native elm, hackberry, and cottonwood are common along the creek channels.

The surface layer is about 13 inches of dark-brown or reddish-brown, friable, noncalcareous silt loam that is medium granular in structure. The subsoil, to a depth of 35 inches, is reddish-brown, granular, firm, calcareous heavy silt loam or light clay loam. The underlying material, to a depth of about 6 feet, is granular, calcareous clay loam that in many places contains concretions of lime. Numerous worm casts occur throughout the profile. Below a depth of 20 inches, the soil is weakly stratified. The surface layer is neutral to alkaline but is noncalcareous. The underlying material is mildy alkaline to strongly calcareous.

Port soils are similar to Spur soils, except that they occur generally on flood plains of local tributaries, consist of red-bed sediments, and have a noncalcareous A horizon. Spur soils occur on low terraces of the North Canadian and South Canadian Rivers and consist of a mixture of sediments.

Typical profile of Port silt loam in a cultivated field in the center of the SW¼SW¼ sec. 32, T. 16 N., R. 19 W.

A_{1p}—0 to 6 inches, dark-brown (7.5YR 4/2) heavy silt loam, dark brown (7.5YR 3/2) when moist; weak, medium, granular structure; slightly hard when dry, friable when moist; noncalcareous; worm casts; plow boundary.

A_{11}—6 to 13 inches, reddish-brown (5YR 4/3) heavy silt loam, dark reddish brown (5YR 3/2) when moist; weak, medium, granular structure; slightly hard when dry, friable when moist; noncalcareous; pronounced worm casts; gradual boundary.

A_{12}—13 to 35 inches, reddish-brown (5YR 4/3) heavy silt loam, dark reddish brown (5YR 3/2) when moist; weak, medium, granular structure; slightly hard when dry, firm when moist; calcareous; pronounced worm casts; weakly stratified; gradual boundary.

AC—35 to 48 inches, reddish-brown (5YR 4/4) light clay loam, dark reddish brown (5YR 3/4) when moist; moderate, fine, granular structure; hard when dry, firm when moist; calcareous; worm casts; stratified.

Range in characteristics.—The surface layer is dark brown, reddish brown, or dark reddish brown, and the subsoil is generally reddish brown. The texture of the surface layer ranges from heavy loam to clay loam. The subsoil is stratified with lenses ranging in texture from sandy loam to silty clay. Depth to calcareous material ranges from 8 to 24 inches. The water table is not ordinarily at a depth of less than 4 feet but may be that high where water is held behind large dams.

Topography.—Level, seldom flooded bottom lands.

Drainage.—Slow runoff; medium internal drainage.

SPUR SERIES.—The Spur series consists of deep, calcareous, brown clayey soils that occur on the high flood plains of the North Canadian and South Canadian Rivers. The parent material is mixed calcareous alluvium of the high plains and of the local red beds. These soils are subirrigated by a water table that is consistently within 4 feet of the surface. The original vegetation consisted of tall and mid grasses. In many places, trees line the creek banks and terrace breaks.

The surface layer is brown, granular, calcareous silty clay loam. The subsoil is reddish-brown, calcareous clay loam. It is underlain by reddish-yellow, stratified, calcareous sandy loam or loamy sand.

Spur soils are similar to Port soils, except that the A horizon is calcareous and generally is less red, and the substratum normally is less clayey. Spur soils generally have a less red A horizon than Yahola soils and are less sandy. They are less mottled and deeper than Alluvial land.

Typical profile of Spur silty clay loam in a cultivated field 100 feet east of the SW. corner of the SE¼ sec. 21, T. 18 N., R. 20 W.

A_{1p}—0 to 7 inches, brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) when moist; moderate, fine, granular structure; hard when dry, firm when moist; calcareous; lenses of fine sand; apparent platiness due to tillage; plow boundary.

A_1—7 to 17 inches, brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) when moist; strong, fine and medium, granular structure; hard when dry, firm when moist; calcareous; numerous worm casts; clear boundary.

AC—17 to 36 inches, reddish-brown (5YR 5/4) light clay loam, dark reddish brown (5YR 3/4) when moist; moderate, medium, granular structure; hard when dry, friable when moist; calcareous; scattered salt crystals in lower part; gradual boundary.

C—36 to 50 inches, reddish-yellow (7.5YR 6/6) loamy fine sand, strong brown (7.5YR 5/6) when moist; structureless; weakly stratified; soft when dry, very friable when moist; calcareous; 4 percent (by volume) salt crystals; faintly mottled with rust color.

Range in characteristics.—The surface layer ranges from clay loam to silty clay loam in texture and from reddish brown to dark brown in color. The subsoil is reddish-brown clay loam or heavy loam.

Topography.—Level flood plains about 10 to 20 feet above the river bed.

Drainage.—Slow runoff; slow internal drainage.

WANN SERIES.—The Wann series consists of deep, calcareous, brown loamy soils that occur on the flood plains of local streams or on fans deposited along the North Canadian and South Canadian Rivers. These soils are occasionally overflowed. The parent material consists of brownish sandy and loamy alluvium from local areas. In most places, the water table is within 5 to 10 feet of the surface. The native vegetation consists of trees and grasses.

The surface layer is granular brown loam. It is underlain, to a depth of about 45 inches, by stratified, structureless, grayish-brown fine sandy loam that is faintly mottled in some places. The substratum is structureless, stratified loamy fine sand. Typically, the entire profile is calcareous.

Wann soils are less mottled and deeper over sand than Alluvial land; less red than Yahola soils; less clayey than Port and Spur soils; deeper and more coherent than Lincoln soils; and lighter colored and more stratified than Canadian soils.

Typical profile of Wann loam in a cultivated field 0.1 mile east of the center of the SW¼ sec. 21, T. 18 N., R. 20 W.

A_{1p} and A—0 to 16 inches, brown (7.5YR 5/4) loam, dark brown (7.5YR 3/3) when moist; weak, medium, granular structure; slightly hard when dry, friable when moist; calcareous; clear boundary.

A_{12}—16 to 30 inches, brown (7.5YR 5/4) loam, dark brown (7.5YR 3/3 when moist; weak, fine and medium, granular structure; slightly hard when dry, friable when moist; calcareous; weakly stratified; some faint mottles; gradual boundary.

AC—30 to 45 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; structureless; soft when dry, very friable when moist; calcareous; faintly mottled with brown; gradual boundary.

C—45 to 60 inches, light-brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) when moist; structureless; loose when dry, soft when moist; calcareous; contains dark grayish-brown stains; stratified; water table at 60 inches.

Range in characteristics.—The surface layer is loam or fine sandy loam and is generally brown. In the uppermost 30 inches the profile contains lenses of sandy loam to clay loam. The substratum is loamy fine sand or fine sand.

Topography.—Occasionally overflowed flood plains; slope of less than 2 percent.

Drainage.—Slow runoff; medium internal drainage.

YAHOLA SERIES.—The Yahola series consists of reddish, calcareous, moderately sandy soils on the flood plains of both large and small streams and on fans or aprons deposited along the North Canadian and South Canadian Rivers by small streams that drain the red-bed areas. These soils occupy more than half of the bottom lands in the county. Although they are occasionally flooded, crops are seldom killed by the overflow of streams. The native vegetation consists principally of tall grasses. Trees, such as cottonwood, elm, and hackberry, line the banks of most small streams.

The A horizon is about 20 inches of weakly stratified, reddish-brown very fine or fine sandy loam that is granular to structureless and generally calcareous. The AC horizon, which extends to a depth of about 43 inches, is calcareous, stratified, yellowish-red fine sandy loam. It is very friable, rapidly drained, and less fertile than the A horizon. The C horizon, or substratum, is calcareous, structureless, and stratified. This material is more sandy and lighter colored than the horizons above.

Yahola soils are more red than is typical of the other alluvial soils in the county. They are less clayey than Spur and Port soils; less shallow over sand than Lincoln soils; and less silty and more stratified than Canadian soils.

The natural vegetation of these soils is tall native grasses. However, most creek banks are lined with trees, principally cottonwood, elm, and hackberry.

Typical profile of Yahola fine sandy loam in a cultivated field 0.1 mile west of the SE. corner of sec. 2, T. 18 N., R. 17 W.

A_{1p}—0 to 8 inches, reddish-brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) when moist; weak, coarse, platy structure; soft when dry, very friable when moist; calcareous; plow boundary.

A_1—8 to 18 inches, reddish-brown (5YR 4/4) very fine sandy loam, dark reddish brown (5YR 3/4) when moist; moderate, medium, granular structure; slightly hard when dry, friable when moist; calcareous; weakly stratified with lenses of coarse sandy loam to loam about the same color as the rest of the horizon; clear boundary.

AC—18 to 40 inches, yellowish-red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) when moist; weak, fine, granular structure; slightly hard when dry, friable when moist; calcareous; stratified with lenses of loam to loamy fine sand, about the same color as the rest of the horizon; gradual boundary.

C—40 to 82 inches, red (2.5YR 5/8) sandy loam, red (2.5YR 4/8) when moist; structureless; soft when dry, very friable when moist; calcareous; stratified; sand grains coarser than those in AC horizon.

Range in characteristics.—The plow layer ranges in texture from loamy fine sand to loam. To a depth of 30 inches, the texture is most commonly fine sandy loam or very fine sandy loam. Depth to and degree of stratification vary. Lenses range in texture from fine sand to silt loam. Colors are dark in places, because of old buried surface layers. Locally, the surface layer is noncalcareous but not acid. In a few depressions, the soil is somewhat darker colored and is heavier textured. The streambed, which is made up of a mixture of recent sediments, forms part of most areas.

Topography.—Flood plains or fans or red-bed drains; slopes of less than 2 percent.

Drainage.—Slow runoff; rapid to medium internal drainage.

Lithosols

Lithosols do not have evident, genetically related horizons. They formed in material that is shallow or very shallow over bedrock or over strongly consolidated parent material. Consequently, they are sometimes called skeletal soils. They generally occur on steep slopes. The native vegetation was short grasses.

The Lithosols in Dewey County have a thin A horizon of calcareous clay loam that is underlain by consolidated claystone of Permian age.

This great soil group is represented in Dewey County only by the Vernon series.

VERNON SERIES.—This series is made up of reddish, shallow, sloping to strongly sloping, moderately clayey soils. The parent material is consolidated claystone of the Permian Red Beds. These soils occur on the Quartermaster formation in the southwestern part of the county. The original vegetation consisted of short grasses, principally blue grama and buffalograss.

The surface layer, which is only about 10 inches thick, is reddish-brown, compact, calcareous clay loam. The underlying material is reddish-brown, very compact, calcareous claystone. It is weathered only in the uppermost few inches.

Vernon soils are less clayey than the associated Quinlan soils.

Typical profile of Vernon clay loam in a native pasture in the center of the SW¼ sec. 6, T. 16 N., R. 20 W.

A_1—0 to 11 inches, reddish-brown (2.5YR 5/4) light clay loam, reddish brown (2.5YR 4/4) when moist; moderate, fine and medium, granular structure; hard when dry, friable when moist; calcareous; clear boundary.

C—11 to 24 inches, reddish-brown (2.5YR 4/4), calcareous, consolidated claystone, dark reddish brown (2.5YR 3/4) when moist.

Range in characteristics.—The texture of the surface layer ranges from heavy silt loam to heavy clay loam. The depth to claystone ranges from 6 to 14 inches. Generally the profile is reddish brown or red.

Topography.—Eroded or shallow, clayey uplands; slopes of 3 to 20 percent.

Drainage.—Very rapid runoff; medium internal drainage.

Regosols

These soils lack evident, genetically related horizons. They formed in deep, unconsolidated regoliths consisting of loess, sand, or glacial till. The native vegetation consisted of mid and tall grasses.

The Regosols in Dewey County have a darkened A horizon that is underlain by a slightly weathered C horizon. The reaction ranges from calcareous to neutral throughout the profile. The parent material is neutral to calcareous windblown material or calcareous packsand and sandstone of Permian age.

The Regosol great soil group is represented in Dewey County by the Enterprise, Quinlan, Tivoli, and Woodward series.

ENTERPRISE SERIES.—The Enterprise series is made up of deep, brown, level to very steeply sloping soils that consist of calcareous eolian sand or silt and alluvial silt of the Quaternary formation. These soils occur on terraces along the North Canadian and South Canadian Rivers and on the bordering uplands. The native vegetation consists of a dense cover of tall grasses and some sand sagebrush.

These soils are fine sandy loam or very fine sandy loam throughout. They have a dark-colored, neutral or calcareous surface layer, and they are lighter colored and more calcareous with depth. Typically, the profile consists of a granular A horizon underlain by weak, prismatic AC and C horizons.

Enterprise soils occur from 20 to 300 feet above the rivers, in association with the more well developed and

more clayey Tipton and Holdrege soils. They are also associated with the less well developed and less clayey Tivoli soils. They are less acid and generally more silty than Pratt soils.

Typical profile of an Enterprise soil in a cultivated field 100 feet east of the NW. corner of sec. 17, T. 17 N., R. 17 W.

A_p—0 to 6 inches, brown (7.5YR 5/4) very fine sandy loam, dark brown (7.5YR 3/4) when moist; weak, medium, granular structure; soft when dry, very friable when moist; noncalcareous; pH 8.0; plow boundary.

A_1—6 to 26 inches, brown (7.5YR 4.5/4) very fine sandy loam, dark brown (7.5YR 3/4) when moist; moderate, medium, granular structure; slightly hard when dry, friable when moist; calcareous; pH 8.0; worm casts numerous; gradual boundary.

AC—26 to 46 inches, light-brown (7.5YR 6/4) very fine sandy loam, brown (7.5YR 4/4) when moist; weak, coarse, prismatic structure breaking to moderate, fine and medium, granular; slightly hard when dry, friable when moist; calcareous; $CaCO_3$ films and threads on prism surfaces; pH 8.0; gradual boundary.

C—46 to 60 inches, light-brown (7.5YR 6/4) very fine sandy loam, brown (7.5YR 4/4) when moist; weak, coarse, prismatic structure breaking to weak, medium, granular; slightly hard when dry, friable when moist; calcareous; numerous films and a few soft concretions of $CaCO_3$; pH 8.0.

Range in characteristics.—Two types of Enterprise soils have been mapped in this county, fine sandy loam and very fine sandy loam. The fine sandy loam is lighter colored and has a slope range of 0 to 20 percent. The very fine sandy loam has a slope range of 0 to 3 percent. The color of the A horizon is dark brown, brown, or light brown, and the color of the AC horizon is brown, light brown, light yellowish brown, or light reddish brown. Some areas are noncalcareous at the surface. Depth to free carbonates ranges from 0 to 24 inches.

Topography.—Level to very steeply sloping mantled uplands, or level to sloping river terraces.

Drainage.—Slow to medium runoff; medium to rapid internal drainage.

QUINLAN SERIES.—The Quinlan series is made up of shallow, immature, calcareous, reddish soils that have formed in Permian sandstone or sandy shale. These soils occur in red-bed areas, on sloping to very steeply sloping uplands. The surface layer generally is reddish-brown or yellowish-red, granular loam. It is underlain by red, fine-grained, weakly cemented calcareous sandstone.

Quinlan soils are the shallowest soils of the sandy or silty red-bed catena that includes Woodward, Carey, and St. Paul soils. Quinlan soils are less deep and less dark colored than the other soils of the catena.

Typical profile of Quinlan loam in a permanent pasture 265 yards south and 350 yards southeast along Oklahoma Highway No. 3 from center of sec. 23, T. 19 N., R. 16 W.

A_1—0 to 11 inches, yellowish-red (5YR 4/6) light loam, yellowish red (5YR 3/6) when moist; weak to moderate, medium, granular structure; soft when dry, friable when moist; calcareous; gradual boundary.

C—11 to 54 inches, red (2.5YR 5/6) weakly cemented, calcareous sandstone, red (2.5YR 3.5/6) when moist.

Range in characteristics.—The thickness of the A horizon varies from 5 to 16 inches. Its color is red, yellowish red, or reddish brown. The parent material is sandy shale, packsand, or sandstone and is usually light red or red. The AC horizon, where it occurs, is no more than 8 inches thick in a few places.

Topography.—Sloping to very steeply sloping red-bed uplands.

Drainage.—Rapid to very rapid runoff; medium internal drainage.

TIVOLI SERIES.—The Tivoli series is made up of youthful, sandy, very rapidly permeable soils that occur in parallel dunes along the north side of both the North Canadian and the South Canadian Rivers. These soils consist of neutral to calcareous eolian sands of Quaternary age. A darkening, or organic staining, in the uppermost 8 to 12 inches is the only sign of profile development. The underlying material is a reddish-yellow, loose fine sand that is uniform in texture to a depth of many feet. Small blowouts and narrow, uneven swales are common. In most places, the vegetation consists of sand sagebrush, post oak, wild plum, skunkbush, some coarse grasses, and some tall grasses.

Tivoli soils have a more sandy subsoil than Pratt and Enterprise soils. They have a less clayey subsoil than Nobscot soils, which are forested and have an A_2 horizon.

Typical profile of Tivoli fine sand in a native pasture 0.4 mile east of the NW. corner of sec. 19, T. 16 N., R. 14 W.

A—0 to 11 inches, light yellowish-brown (10YR 6/4) fine sand, dark yellowish brown (10YR 4/4) when moist; single grain; loose when dry, very friable when moist; neutral; clear boundary.

C—11 to 36 inches, reddish-yellow (7.5YR 7/5) fine sand, strong brown (7.5YR 5/6) when moist; structureless; loose when moist and when dry; neutral.

Range in characteristics.—Two types of Tivoli soils are mapped in Dewey County, loamy fine sand and fine sand. The loamy fine sand is mapped in a complex with Pratt soils. Its surface layer is brown and about 15 inches thick. The surface layer ranges from brown to light yellowish brown, and the subsoil ranges from very pale brown to light yellowish brown. The reaction is neutral to mildly alkaline.

Topography.—Duned areas on river terraces.

Drainage.—Slow runoff; very rapid internal drainage.

WOODWARD SERIES.—The Woodward series is made up of calcareous, immature, reddish loamy soils that formed in material weathered from Permian sandstone and sandy shale. These soils occur in nearly level to very steeply sloping red-bed areas throughout the county. They are common on the convex uplands between Taloga and Putnam and in the vicinity of Lenora, Camargo, and Leedey.

The granular, reddish-brown, loamy A horizon grades to thick, reddish, transitional horizons, which commonly are underlain by sandstone. The lower part of the A horizon and the uppermost part of the AC horizon have numerous worm casts. The AC horizon is granular and contains lime concretions and sandstone fragments. These concretions become more concentrated in the C_{ca} horizon.

Woodward soils are associated with St. Paul, Carey, and Quinlan soils. They are less well developed and less clayey than St. Paul and Carey soils, and less youthful and deeper than Quinlan soils. They are more alkaline and less sandy than Woodward soils.

Typical profile of Woodward loam in a native pasture about the center of the NE¼SE¼SE¼ sec. 12, T. 19 N., R. 18 W.

A_1—0 to 16 inches, reddish-brown (5YR 4/4) loam, dark reddish brown (5YR 3/4) when moist; moderate, medium and fine, granular structure; slightly hard when dry, friable when moist; calcareous below 9 inches; worm casts; gradual boundary.

AC—16 to 36 inches, yellowish-red (5YR 5/6) loam, yellowish red (5YR 4/6) when moist; weak, fine, granular structure; slightly hard when dry, friable when moist; calcareous; worm casts in upper part; clear boundary.

C_{ca}—36 to 42 inches, reddish-yellow (5YR 6/6) loam, yellowish red (5YR 5/6) when moist; structureless; soft when dry, friable when moist; strongly calcareous; calcium carbonate concretions make up 40 percent of the volume; gradual boundary.

C—42 to 60 inches, red (2.5YR 5/6), soft, calcareous Permian sandstone, red (2.5YR 4/6) when moist; scattered bands of segregated lime.

Range in characteristics.—Three types of Woodward soils are mapped in this county: loam, as modal and most extensive; fine sandy loam; and silt loam. Both the fine sandy loam and the silt loam are mapped as part of complexes. The A horizon is dark reddish brown to reddish brown, the AC horizon is reddish yellow to yellowish red, and the parent material is red or light red. The A horizon is generally about 18 inches thick. The calcium carbonate horizon is slightly evident to prominent. The parent material ranges from sandstone to sandy shale, and its degree of consolidation varies.

Topography.—Nearly level to very steeply sloping redbed uplands.

Drainage.—Moderate to rapid runoff; medium internal drainage.

Glossary

Alluvium. Fine material, such as sand, silt, or clay, that has been deposited on land by streams.

Bench. See Terrace, geological.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Catena, soil. A sequence, or "chain," of soils on a landscape; they developed from one kind of parent material but have different characteristics because of differences in relief and drainage.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: Clay coat, clay skin.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

Concretions. Hard grains, pellets, or nodules, of various sizes, shapes, and colors, consisting of concentrations of compounds that cement the soil grains together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Compact. Dense and firm but not cemented.

Friable. When moist, crushes easily under pressure between thumb and forefinger and can be pressed together into a lump.

Firm. When moist, crushes under moderate pressure between thumb and forefinger but resistance is distinctly noticeable.

Hard. When dry, moderately resistant to pressure: can be broken with difficulty between thumb and forefinger.

Loose. Noncoherent; will not hold together in a mass.

Soft. When dry, breaks into powder or individual grains under very slight pressure.

Plastic. When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a wire when rolled between thumb and forefinger.

Sticky. When wet, adheres to other material; tends to stretch somewhat and pull apart, rather than pull free from other material.

Cemented. Hard and brittle; little affected by moistening.

Diversion. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Eolian (aeolian) soil material. Soil parent material accumulated through wind action; commonly refers to sandy material in dunes.

Erosion. The wearing away of the land surface by wind, running water, and other geological agents.

Erosion control dam. An impounding-type structure used to store runoff and release it (1) through a pipe or pipes into a principal spillway where the water is discharged at a safe rate or (2) through a diversion spillway to an area where the water can be released without causing erosion.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, and covered by grass for protection against erosion; used to conduct surface water away from cropland.

High Plains outwash. Soil material that has been washed from the Rocky Mountains and spread over the High Plains.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes.

Impounding-type terrace. A terrace built to conserve water. Constructed entirely from the downslope side.

Inclusion. An area of soil that has been included in the mapping unit of a soil of a different kind because the area was too small to be mapped separately on a map of the scale used.

Loess. Geological deposit of fairly uniform fine material, mostly silt, presumably transported by wind.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: contrast—*faint, distinct,* and *prominent;* abundance—*few, common,* and *many;* and size—*fine, medium,* and *coarse.* The size measurements are: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Ped. A crumb, a prism, a block, or other individual natural soil aggregate, in contrast to a clod.

Permeability. That quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil type based on differences that affect management but not classification. Differences in slope or in stoniness, for example, may be the basis for dividing a soil type into phases.

Pipe drop. Pipes used to carry all expected runoff to a safe elevation (usually base grade) for discharge. The lower ends of small waterways, field terraces, and diversion terraces can be protected by the use of pipe drops.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material. See, also, Horizon, soil.

Range site. An area of range within which climate, soils, and topography are sufficiently uniform to produce a distinct kind of climax vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus—

	pH		pH
Extremely acid	Below 4.5	Mildly alkaline	7.4–7.8
Very strongly acid	4.5–5.0	Moderately alkaline	7.9–8.4
Strongly acid	5.1–5.5	Strongly alkaline	8.5–9.0
Medium acid	5.6–6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1–6.5		
Neutral	6.6–7.3		

Red beds. A general term for geologic formations, commonly sandstone or shale, of the Permian period, or the reddish soils developed from these formations.

Savannah (also spelled savanna). A grassland characterized by scattered trees.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons similar, except for the texture of the surface soil, in differentiating characteristics and in arrangement in the profile.

Slope, soil. The number of feet of fall (expressed in percent) per 100 feet of horizontal distance. Slope terms and their numerical equivalents used in this report are as follows: *nearly level*—0 to 1 percent slopes; *gently sloping*—1 to 3 percent slopes: *sloping*—3 to 5 percent slopes; *strongly sloping*—5 to 8 percent slopes; *steep*—8 to 12 percent slopes; *very steep*—more than 12 percent slopes.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in a mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying parent material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand or (2) *massive* (the particles adhering without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. Any layer beneath the solum or true soil. The term is applied both to parent material and to other layers unlike the parent material, below the B horizon or the subsoil.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness; the plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. Stream terraces are frequently called *second bottoms*, as contrasted to *flood plains*, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide. Sometimes called a *bench*.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportions of fine particles, are as follows: sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Type, soil. A subdivision of the soil series that is made on the basis of differences in the texture of the surface layer.

Winnowing. The removal of the fine particles from the plow layer of a soil by action of the wind.

GUIDE TO MAPPING UNITS

[See table 5, p. 16, for approximate acreage and proportionate extent of soils; table 6, p. 41, for estimated yields of principal crops; table 7, p. 46, for suitability of soils for windbreaks; and tables 8, 9, and 10, p. 50, 56, and 60, respectively, for interpretations for engineering]

Map symbol	*Soil name*	*Page*	*Capability unit*		*Range site*	
			Symbol	*Page*	*Name*	*Page*
Ad	Alluvial land	15	Vw-1	39	Subirrigated	42
Bf	Brazos loamy fine sand	16	IIIe-3	37	Sandy Bottom Land	43
Br	Broken land	16	VIe-2	39	Sandy Prairie	43
Ca	Canadian loam	17	I-1	34	Loamy Bottom Land	43
CeB	Carey silt loam, 1 to 3 percent slopes	17	IIe-1	35	Loamy Prairie	44
CeC	Carey silt loam, 3 to 5 percent slopes	17	IIIe-1	36	Loamy Prairie	44
CeD	Carey silt loam, 5 to 8 percent slopes	17	IVe-1	38	Loamy Prairie	44
Cp	Carwile-Pratt complex	18	IIIw-1	37	Sandy Prairie	43
DfC	Dill fine sandy loam, 1 to 5 percent slopes	18	IIIe-2	36	Sandy Prairie	43
DfD2	Dill fine sandy loam, 3 to 8 percent slopes, eroded	18	IVe-2	38	Sandy Prairie	43
DfD	Dill fine sandy loam, 5 to 8 percent slopes	18	IVe-2	38	Sandy Prairie	43
EfB	Enterprise fine sandy loam, 0 to 3 percent slopes	19	IIIe-4	37	Sandy Prairie	43
EfC	Enterprise fine sandy loam, 3 to 5 percent slopes	19	IIIe-2	36	Sandy Prairie	43
EfD	Enterprise fine sandy loam, 5 to 8 percent slopes	19	IVe-2	38	Sandy Prairie	43
EfE	Enterprise fine sandy loam, 8 to 20 percent slopes	19	VIe-2	39	Sandy Prairie	43
EnA	Enterprise very fine sandy loam, 0 to 1 percent slopes	19	IIc-1	36	Loamy Prairie	44
EnB	Enterprise very fine sandy loam, 1 to 3 percent slopes	19	IIe-1	35	Loamy Prairie	44
Er	Eroded sandy land	19	VIe-8	40	Eroded Sandy Land	44
FaA	Farnum fine sandy loam, 0 to 1 percent slopes	20	IIe-2	35	Sandy Prairie	43
HoA	Holdrege silt loam, 0 to 1 percent slopes	20	IIc-1	36	Loamy Prairie	44
HoB	Holdrege silt loam, 1 to 3 percent slopes	20	IIe-1	35	Loamy Prairie	44
Ln	Lincoln soils	21	Vw-2	39	Sandy Bottom Land	43
Lo	Lofton clay loam	21	IIIw-1	37	Hard Land	44
MfA	Miles fine sandy loam, 0 to 1 percent slopes	22	IIe-2	35	Sandy Prairie	43
MfB	Miles fine sandy loam, 1 to 3 percent slopes	22	IIIe-4	37	Sandy Prairie	43
MfB2	Miles fine sandy loam, 1 to 3 percent slopes, eroded	22	IIIe-2	36	Sandy Prairie	43
MfC	Miles fine sandy loam, 3 to 5 percent slopes	22	IIIe-2	36	Sandy Prairie	43
MfC2	Miles fine sandy loam, 3 to 5 percent slopes, eroded	22	IVe-2	38	Sandy Prairie	43
MfD	Miles fine sandy loam, 5 to 8 percent slopes	22	IVe-2	38	Sandy Prairie	43
MfD2	Miles fine sandy loam, 5 to 8 percent slopes, eroded	22	IVe-2	38	Sandy Prairie	43
NoE	Nobscot fine sand, rolling	23	VIe-3	39	Deep Sand Savannah	43
NpC	Nobscot-Pratt complex, hummocky	23	IVe-3	39	Deep Sand Savannah	43
Po	Port silt loam	23	I-1	34	Loamy Bottom Land	43
PpB	Pratt loamy fine sand, undulating	24	IIIe-3	37	Deep Sand	43
PpC	Pratt loamy fine sand, hummocky	24	IVe-3	39	Deep Sand	43
PrB	Pratt loamy fine sand, heavy subsoil variant, undulating	24	IIIe-3	37	Deep Sand Savannah	43
Ps	Pratt fine sandy loam, 1 to 3 percent slopes	24	IIIe-4	37	Sandy Prairie	43
Pt	Pratt-Tivoli loamy fine sands	24	VIe-1	39	Deep Sand	43
Qm	Quinlan loam	25	VIe-4	39	Shallow Prairie	44
Qn3	Quinlan soils, severely eroded	25	VIe-6	40	Eroded Prairie	44
Qp	Quinlan-Enterprise complex	25	VIe-5	39	Shallow Prairie and Sandy Prairie.	44, 43
QwC2	Quinlan-Woodward loams, 3 to 5 percent slopes, eroded	25	IVe-1	38	Shallow Prairie and Loamy Prairie.	44
QwE	Quinlan-Woodward loams, 5 to 20 percent slopes	25	VIe-7	40	Shallow Prairie and Loamy Prairie.	44
Rb	Rough broken land	26	VIIe-1	40	Breaks	45
SaA	St. Paul silt loam, 0 to 1 percent slopes	26	IIc-1	36	Hard Land	44
SaB	St. Paul silt loam, 1 to 3 percent slopes	26	IIe-1	35	Hard Land	44
SaC	St. Paul silt loam, 3 to 5 percent slopes	26	IIIe-1	36	Hard Land	44
ScC2	St. Paul clay loam, 3 to 5 percent slopes, eroded	26	IVe-1	38	Hard Land	44
Sp	Spur clay loam, deep water table	27	I-1	34	Subirrigated	42
TpA	Tipton silt loam, 0 to 1 percent slopes	27	I-1	34	Loamy Prairie	44
Tv	Tivoli fine sand	27	VIIe-2	40	Dune and Deep Sand	45, 43
Vs3	Vernon soils, severely eroded	27	VIe-6	40	Eroded Prairie	44
Vx	Vernon complex	28	VIe-9	40	Red Clay Prairie and Red Shale	44, 45
Wa	Wann soils	28	IIw-1	35	Loamy Bottom Land	43
WbC	Woodward loam, 3 to 5 percent slopes	28	IIIe-1	36	Loamy Prairie	44
WcB	Woodward-Carey complex, 1 to 3 percent slopes	28	IIe-1	35	Loamy Prairie	44
WcC2	Woodward-Carey complex, 3 to 5 percent slopes, eroded	29	IVe-1	38	Loamy Prairie	44
WcD2	Woodward-Carey complex, 5 to 8 percent slopes, eroded	29	IVe-1	38	Loamy Prairie	44
WdB	Woodward-Dill fine sandy loams, 0 to 3 percent slopes	29	IIe-2	35	Sandy Prairie	43
WwC	Woodward-Quinlan loams, 3 to 5 percent slopes	29	IVe-1	38	Loamy Prairie and Shallow Prairie.	44
Ya	Yahola fine sandy loam, high	30	IIe-2	35	Loamy Bottom Land	43
Yf	Yahola fine sandy loam	30	IIw-1	35	Loamy Bottom Land	43

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All Other Inquiries

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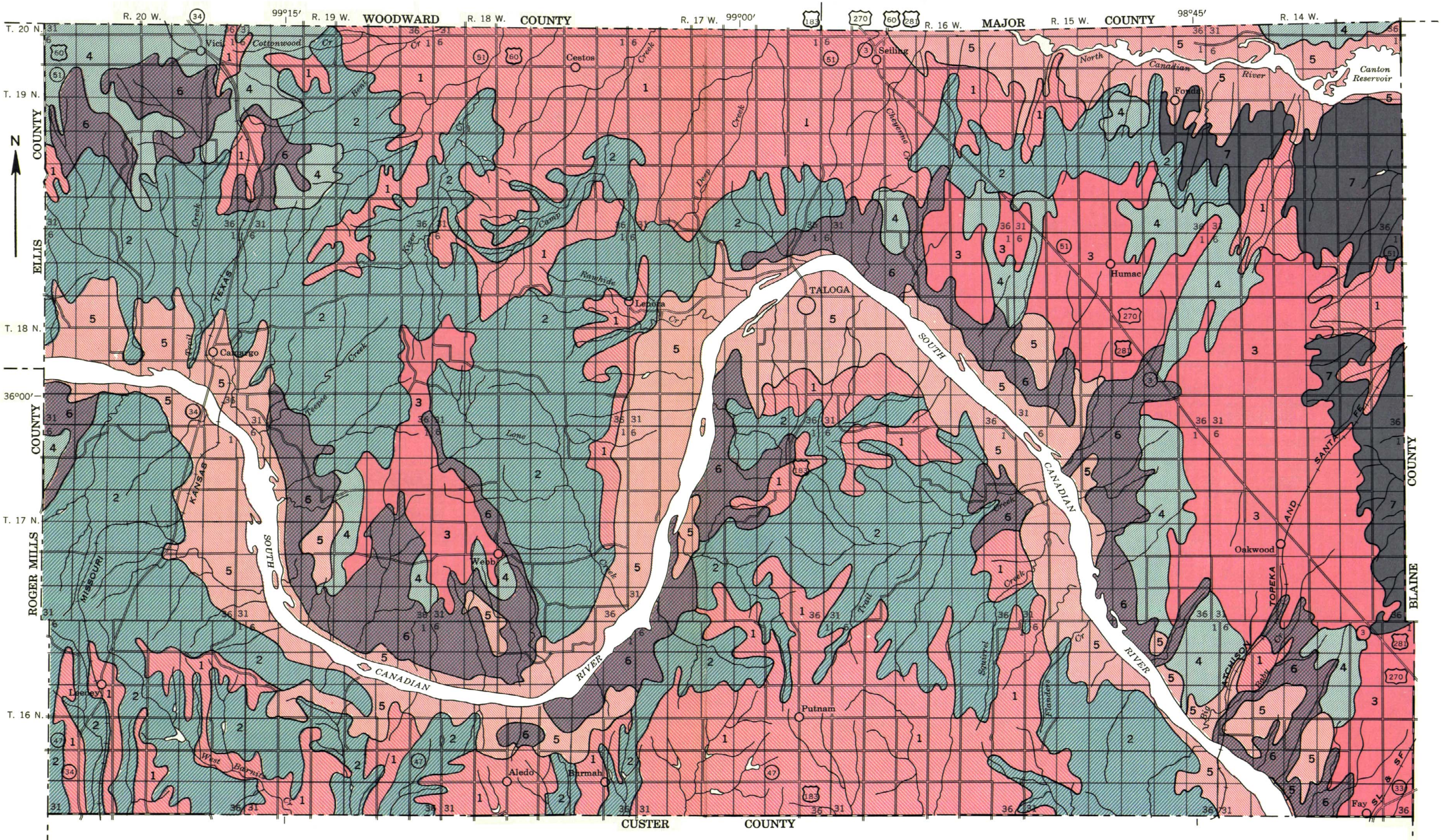
GENERAL SOIL MAP
DEWEY COUNTY, OKLAHOMA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
OKLAHOMA AGRICULTURAL EXPERIMENT STATION



SOIL ASSOCIATIONS

1. St. Paul-Carey-Holdrege association: Loamy uplands.
2. Quinlan-Woodward association: Red-bed hills.
3. Nobscot-Pratt association: Rolling and hummocky sands.
4. Miles-Pratt-Carwile association: Sandy upland flats.
5. Tipton-Enterprise-Lincoln association: Benches and flood plains.
6. Pratt-Quinlan-Enterprise association: Dunes and breaks.
7. Woodward-Dill-Miles association: Sandy uplands and red-bed hills.

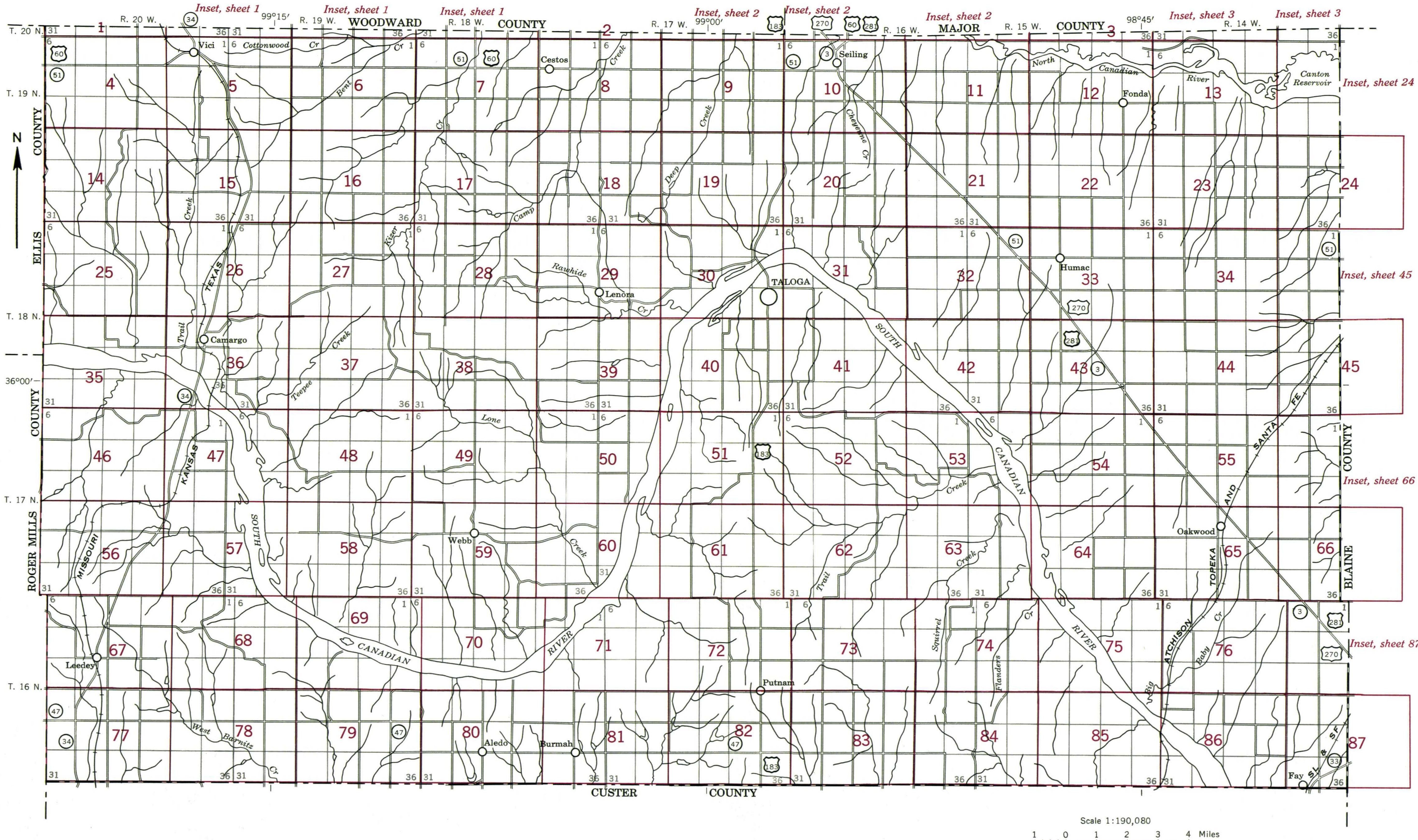
July 1962

Scale 1:190,080

1 0 1 2 3 4 Miles

INDEX TO MAP SHEETS

DEWEY COUNTY, OKLAHOMA



SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, if used, shows the slope. A final number, 2 or 3, shows that the soil is eroded or severely eroded.

SYMBOL	NAME
Ad	Alluvial land
Bf	Brazos loamy fine sand
Br	Broken land
Ca	Canadian loam
CeB	Carey silt loam, 1 to 3 percent slopes
CeC	Carey silt loam, 3 to 5 percent slopes
CeD	Carey silt loam, 5 to 8 percent slopes
Cp	Carwile-Pratt complex
DfC	Dill fine sandy loam, 1 to 5 percent slopes
DfD	Dill fine sandy loam, 5 to 8 percent slopes
DfD2	Dill fine sandy loam, 3 to 8 percent slopes, eroded
EfB	Enterprise fine sandy loam, 0 to 3 percent slopes
EfC	Enterprise fine sandy loam, 3 to 5 percent slopes
EfD	Enterprise fine sandy loam, 5 to 8 percent slopes
EfE	Enterprise fine sandy loam, 8 to 20 percent slopes
EnA	Enterprise very fine sandy loam, 0 to 1 percent slopes
EnB	Enterprise very fine sandy loam, 1 to 3 percent slopes
Er	Eroded sandy land
FaA	Farnum fine sandy loam, 0 to 1 percent slopes
HoA	Holdrege silt loam, 0 to 1 percent slopes
HoB	Holdrege silt loam, 1 to 3 percent slopes
Ln	Lincoln soils
Lo	Lofton clay loam
MfA	Miles fine sandy loam, 0 to 1 percent slopes
MfB	Miles fine sandy loam, 1 to 3 percent slopes
MfB2	Miles fine sandy loam, 1 to 3 percent slopes, eroded
MfC	Miles fine sandy loam, 3 to 5 percent slopes
MfC2	Miles fine sandy loam, 3 to 5 percent slopes, eroded
MfD	Miles fine sandy loam, 5 to 8 percent slopes
MfD2	Miles fine sandy loam, 5 to 8 percent slopes, eroded
NoE	Nobscot fine sand, rolling
NpC	Nobscot-Pratt complex, hummocky
Po	Port silt loam
PpB	Pratt loamy fine sand, undulating
PpC	Pratt loamy fine sand, hummocky
PrB	Pratt loamy fine sand, heavy subsoil variant, undulating
Ps	Pratt fine sandy loam, 1 to 3 percent slopes
Pt	Pratt-Tivoli loamy fine sands
Qm	Quinlan loam
Qn3	Quinlan soils, severely eroded
Qp	Quinlan-Enterprise complex
QwC2	Quinlan-Woodward loams, 3 to 5 percent slopes, eroded
QwE	Quinlan-Woodward loams, 5 to 20 percent slopes
Rb	Rough broken land
SaA	St. Paul silt loam, 0 to 1 percent slopes
SaB	St. Paul silt loam, 1 to 3 percent slopes
SaC	St. Paul silt loam, 3 to 5 percent slopes
ScC2	St. Paul clay loam, 3 to 5 percent slopes, eroded
Sp	Spur clay loam, deep water table
TpA	Tipton silt loam, 0 to 1 percent slopes
Tv	Tivoli fine sand
Vs3	Vernon soils, severely eroded
Vx	Vernon complex
Wa	Wann soils
WbC	Woodward loam, 3 to 5 percent slopes
WcB	Woodward-Carey complex, 1 to 3 percent slopes
WcC2	Woodward-Carey complex, 3 to 5 percent slopes, eroded
WcD2	Woodward-Carey complex, 5 to 8 percent slopes, eroded
WdB	Woodward-Dill fine sandy loams, 0 to 3 percent slopes
WwC	Woodward-Quinlan loams, 3 to 5 percent slopes
Ya	Yahola fine sandy loam, high
Yf	Yahola fine sandy loam

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads

- Dual
- Good motor
- Poor motor
- Trail

Highway markers

- National Interstate
- U. S.
- State

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail, foot
- Railroad
- Ferries
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings

- School
- Church
- Station

Mines and Quarries

Mine dump

Pits, gravel or other

Power lines

Pipe lines

Cemeteries

Dams

Levees

Tanks

Oil wells

Windmills

BOUNDARIES

- National or state
- County
- Township, U. S.
- Section line, corner
- Reservation
- Land grant

DRAINAGE

Streams

- Perennial
- Intermittent, unclass.

Canals and ditches — CANAL, DITCH

Lakes and ponds

- Perennial
- Intermittent

Wells — flowing

Springs

Marsh

Wet spot

RELIEF

Escarpments

- Bedrock
- Other

Prominent peaks

Depressions (Large, Small)

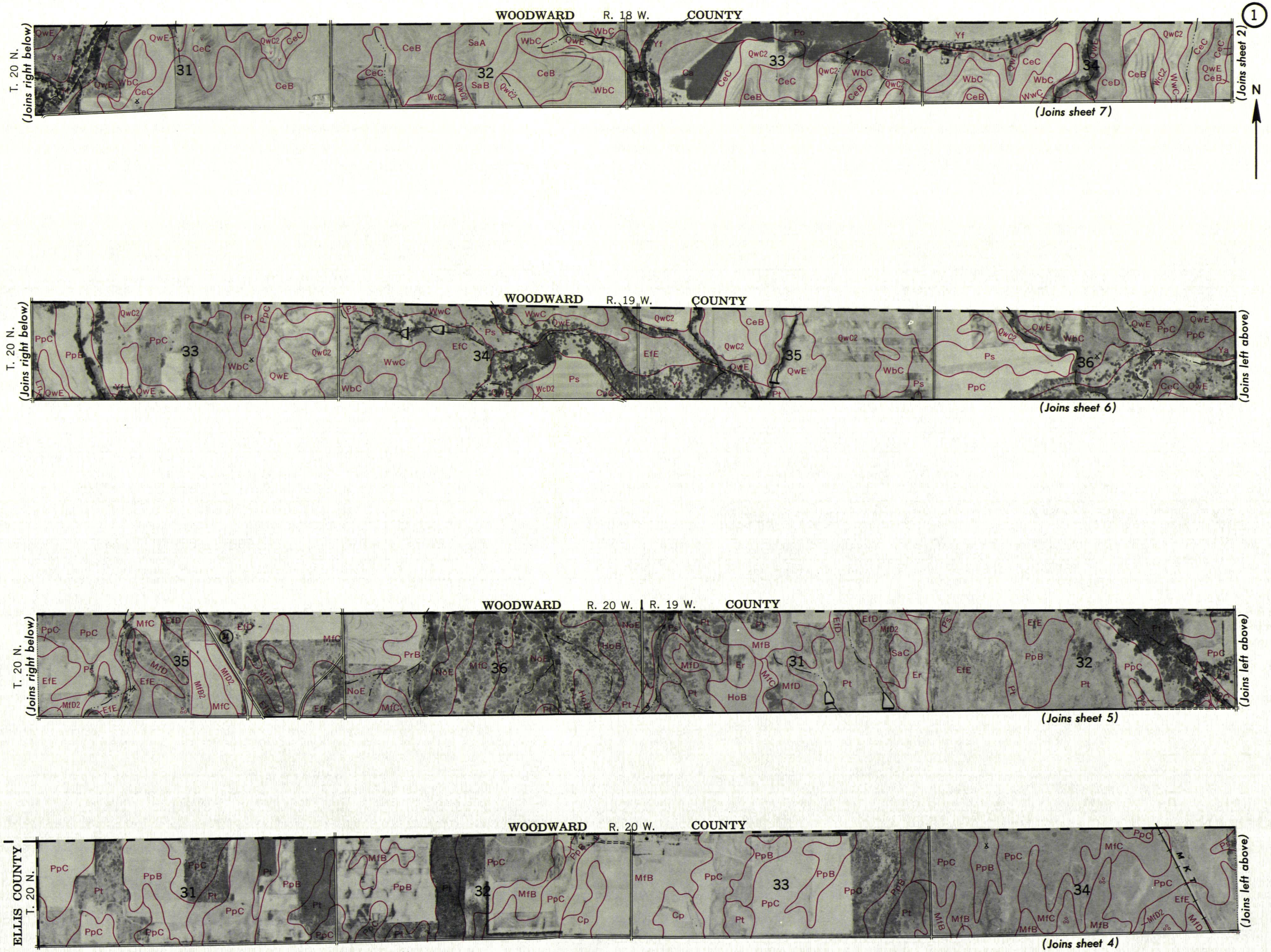
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol — Dx
- Gravel
- Stones
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gullies

Soil map constructed 1962 by Cartographic Division, Soil Conservation Service, USDA, from 1957 aerial photographs. Controlled mosaic based on Oklahoma plane coordinate system, north zone, Lambert conformal conic projection, 1927 North American datum.

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 1

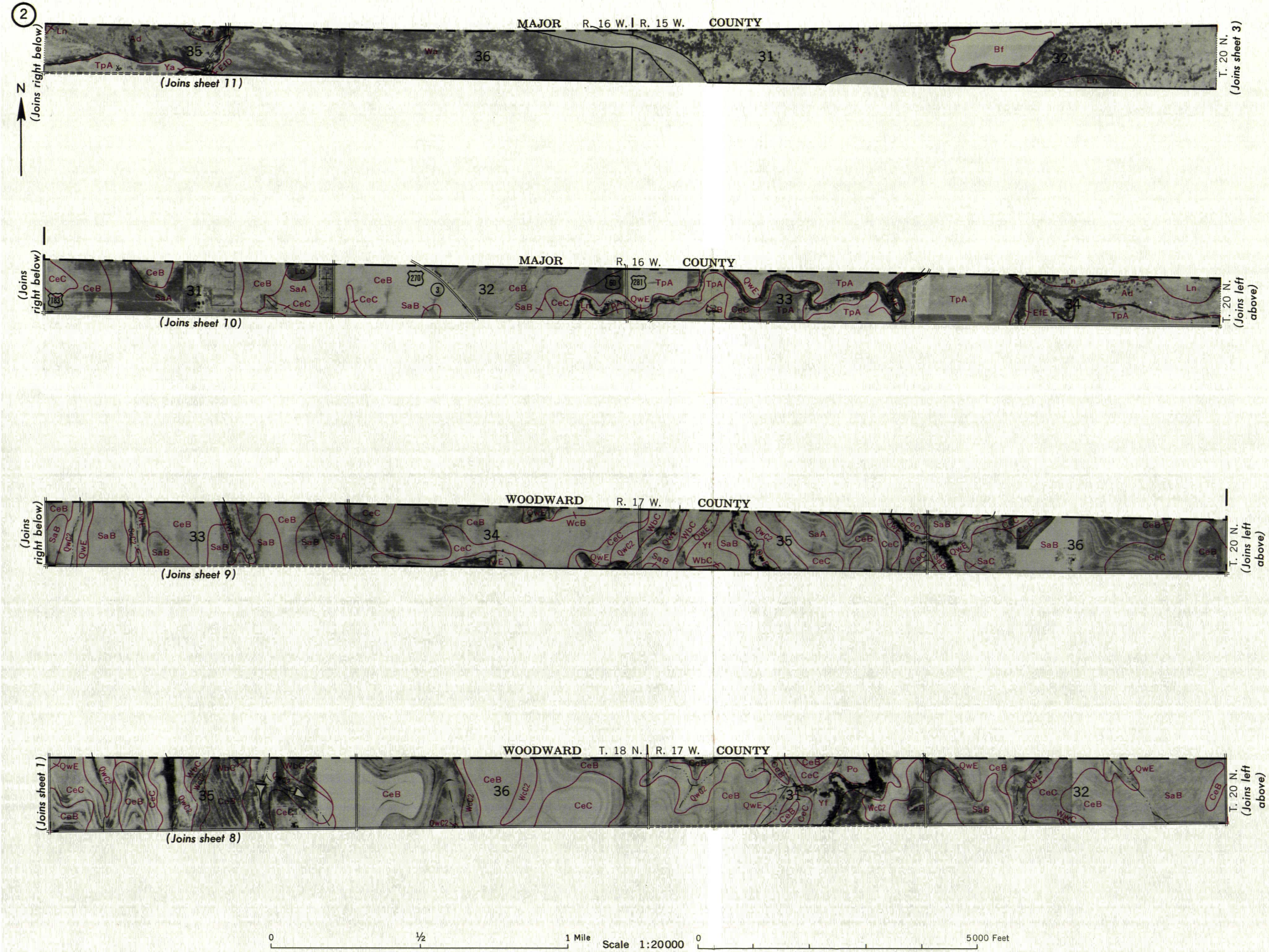


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

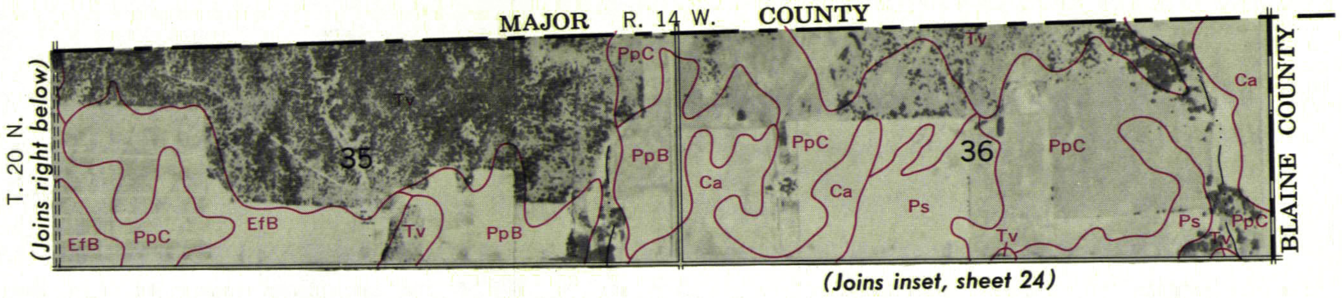
Range, township, and section corners shown on this map are indefinite.

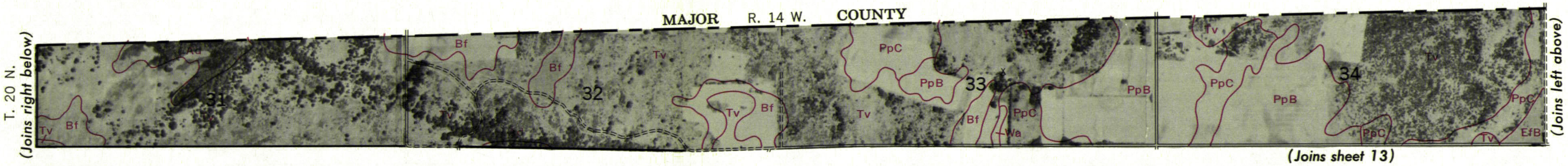
DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 2

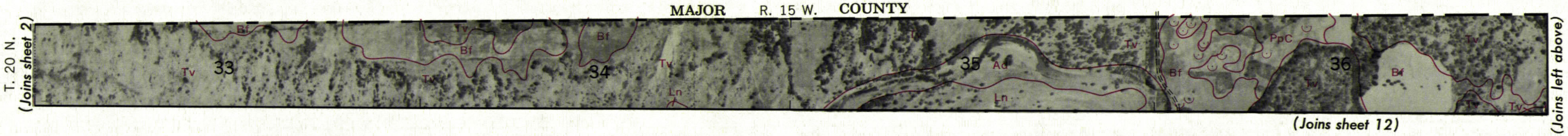


3

N







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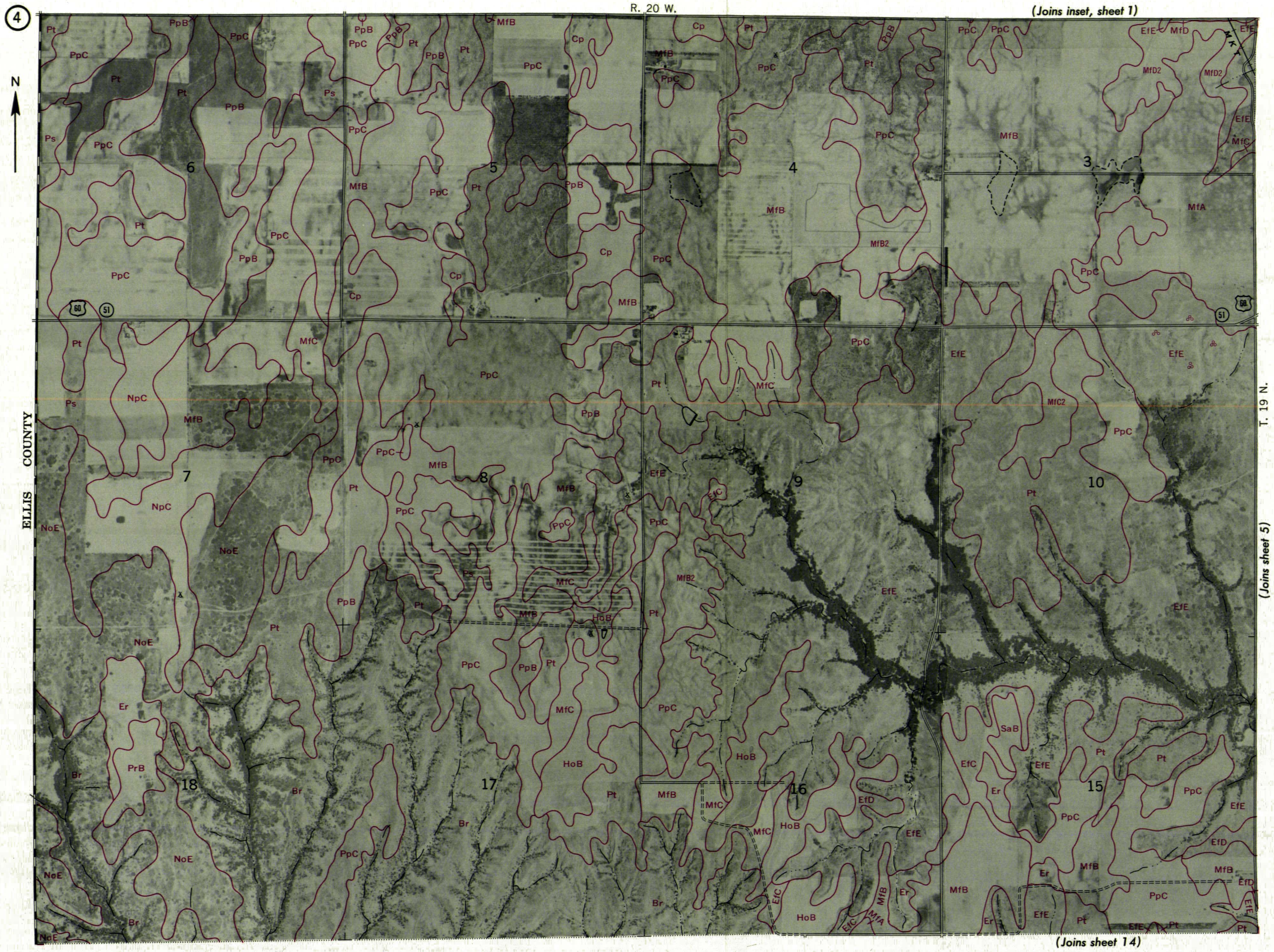
DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 4



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DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 5

R. 20 W. | R. 19 W.

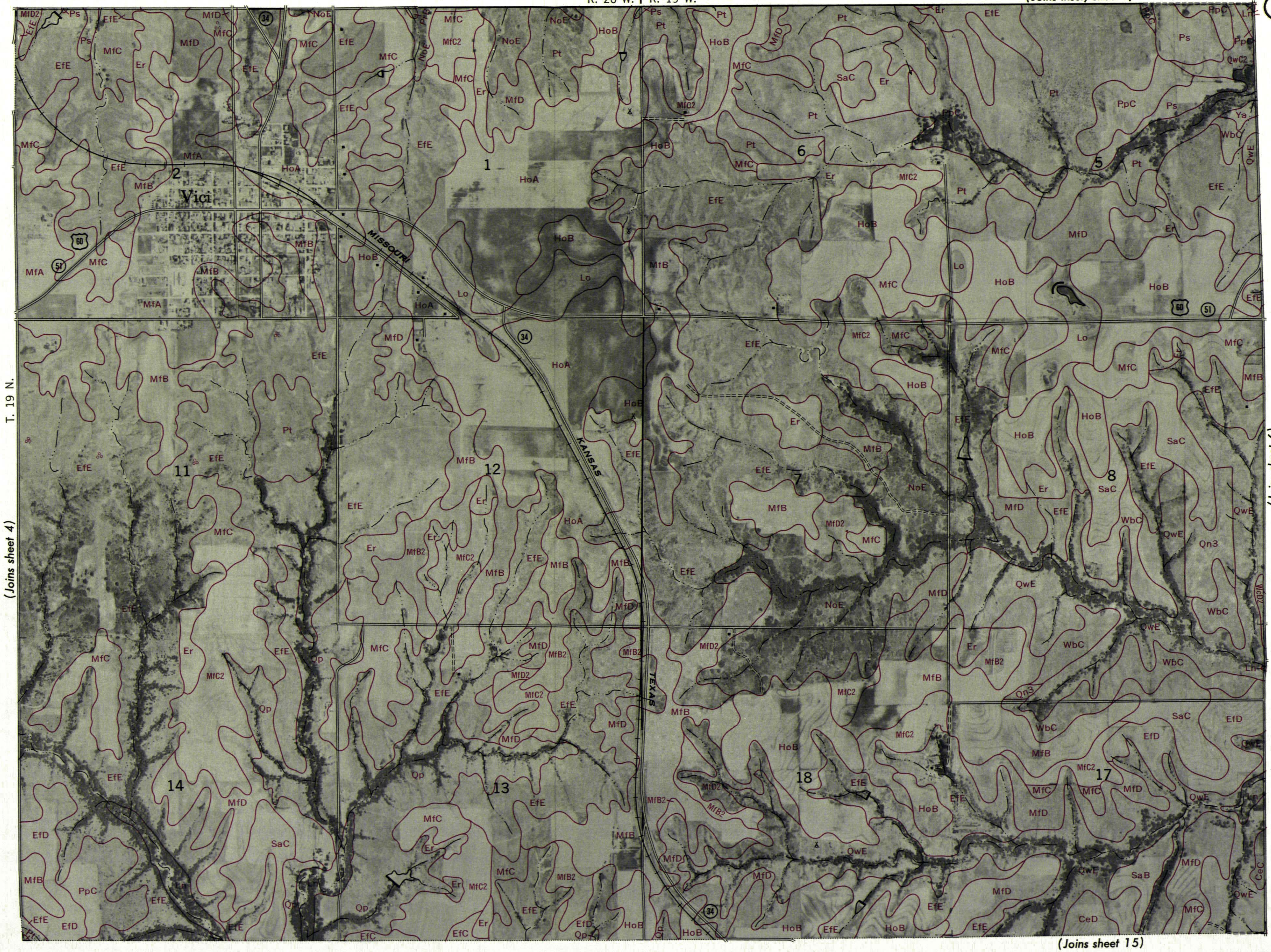
(Joins inset, sheet 1)

5

N

T. 19 N.

(Joins sheet 4)



(Joins sheet 6)

(Joins sheet 15)

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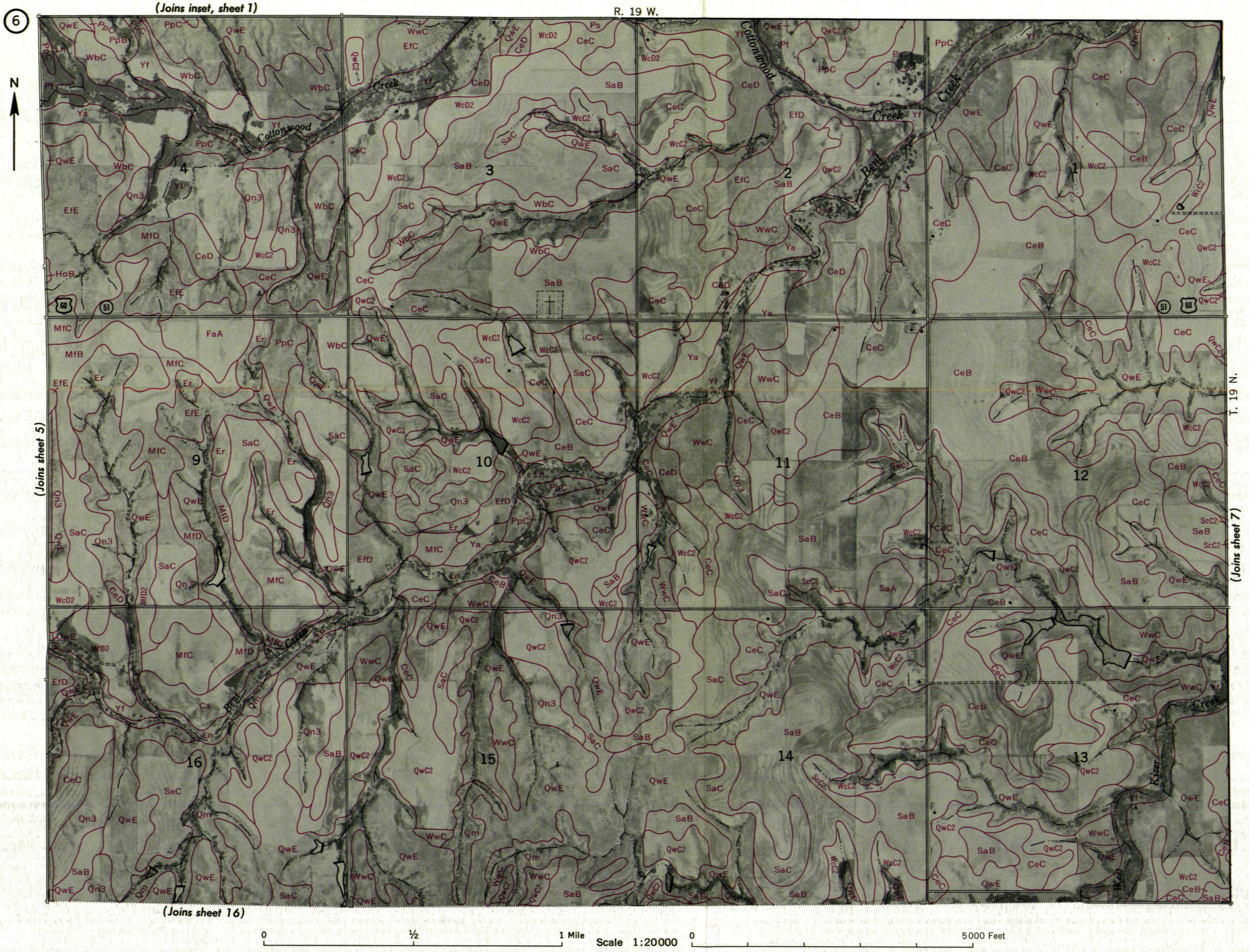
DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 6



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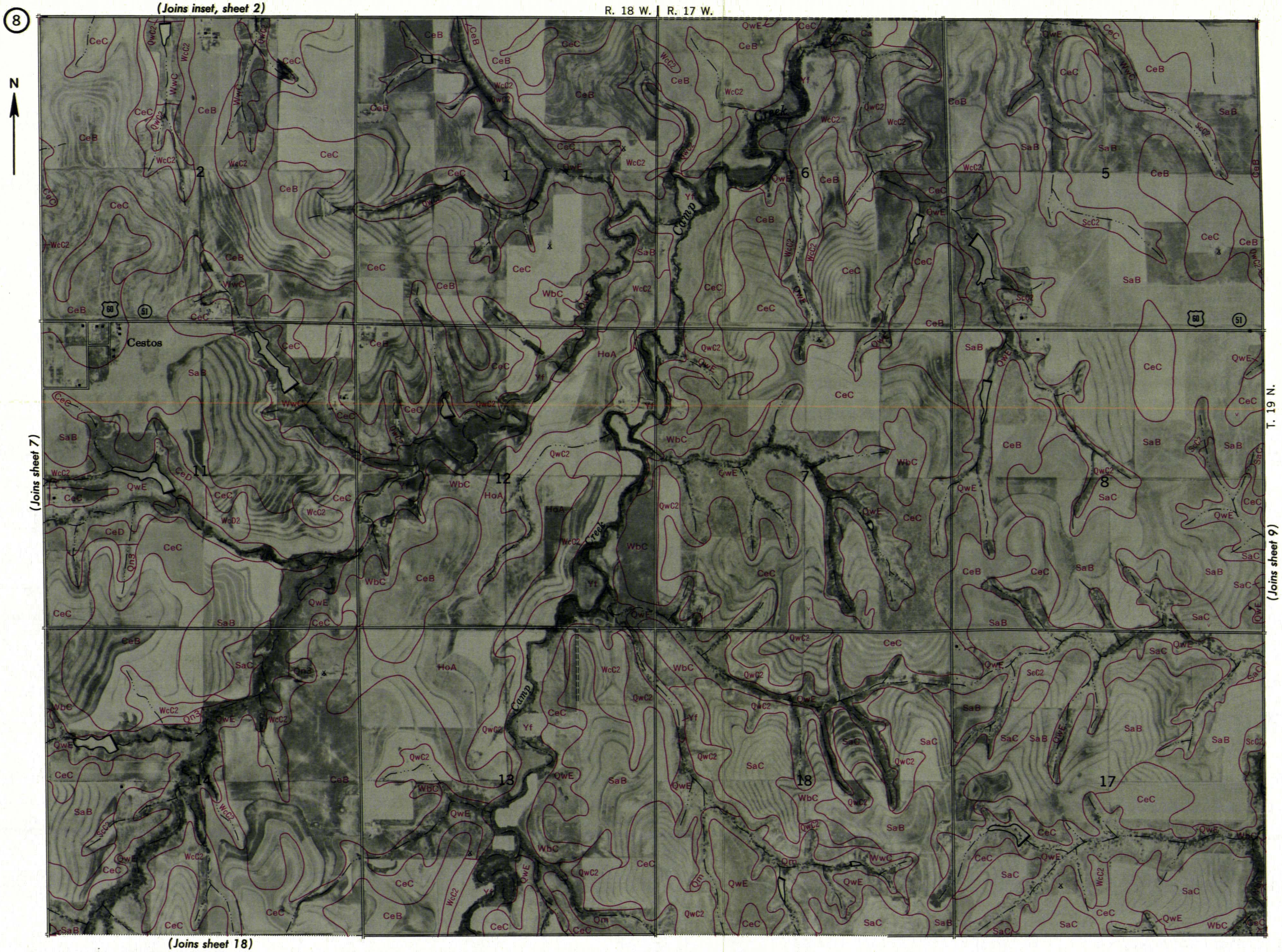
DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 8



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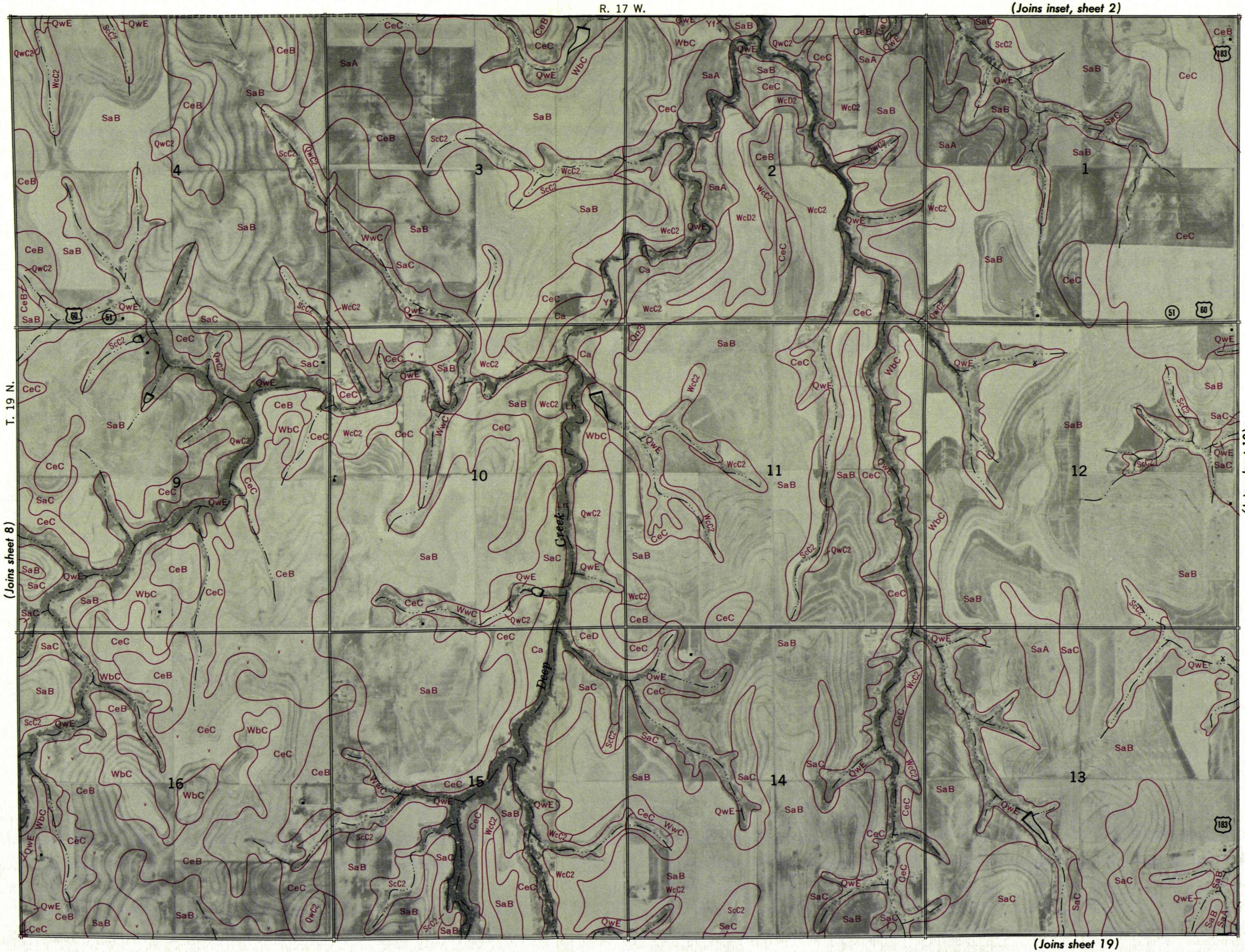

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0 ½ 1 Mile Scale 1:20000 0 5000 Feet


10
(Joins inset, sheet 2)
R. 16 W.
T. 19 N.
(Joins sheet 9)
(Joins sheet 11)
(Joins sheet 20)
N
SEILING
Seiling Creek
Cheyenne Creek
6
5
4
3
7
8
9
10
18
17
16
15
0
½
1 Mile
Scale 1:20000
0
5000 Feet

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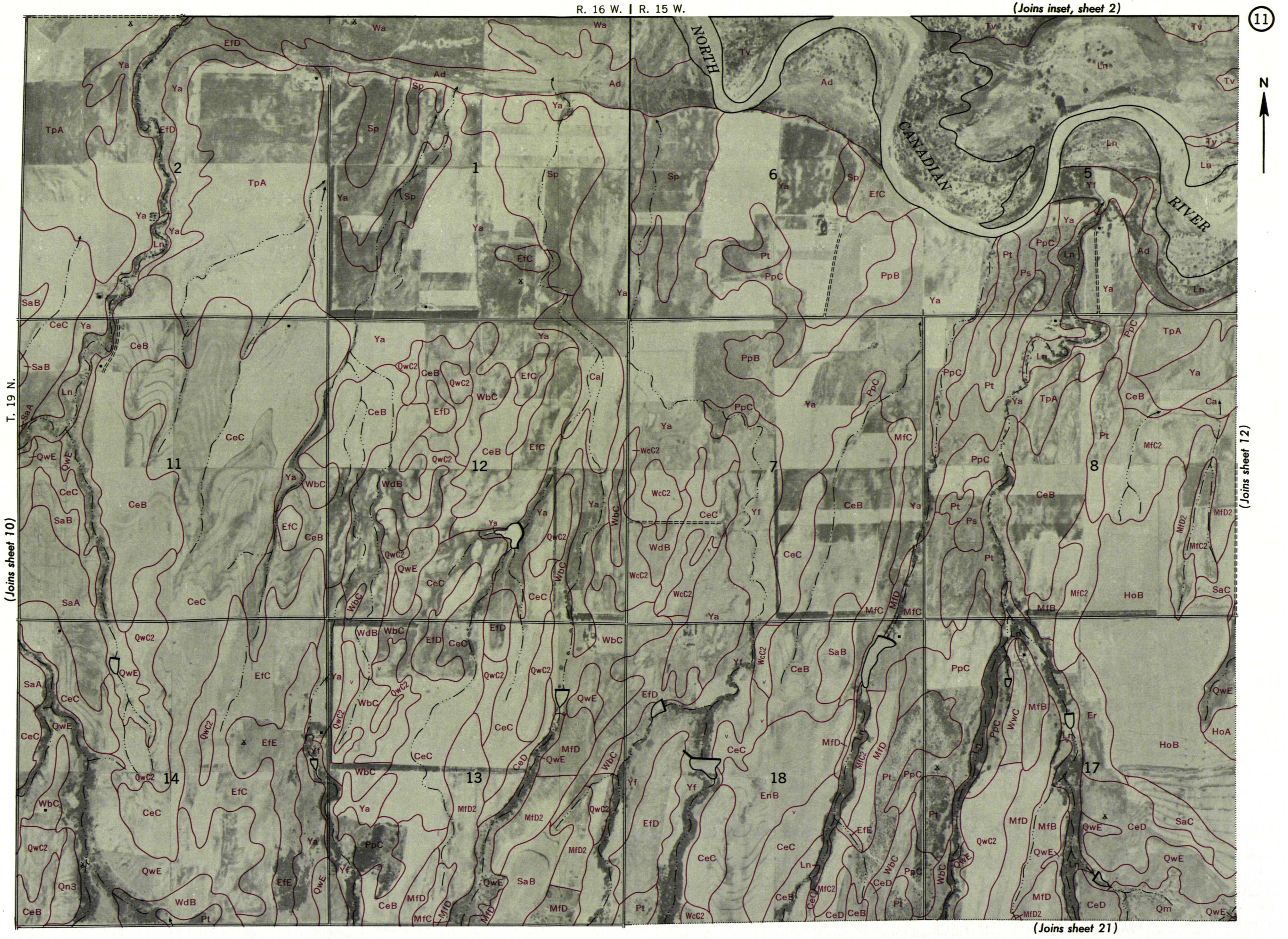
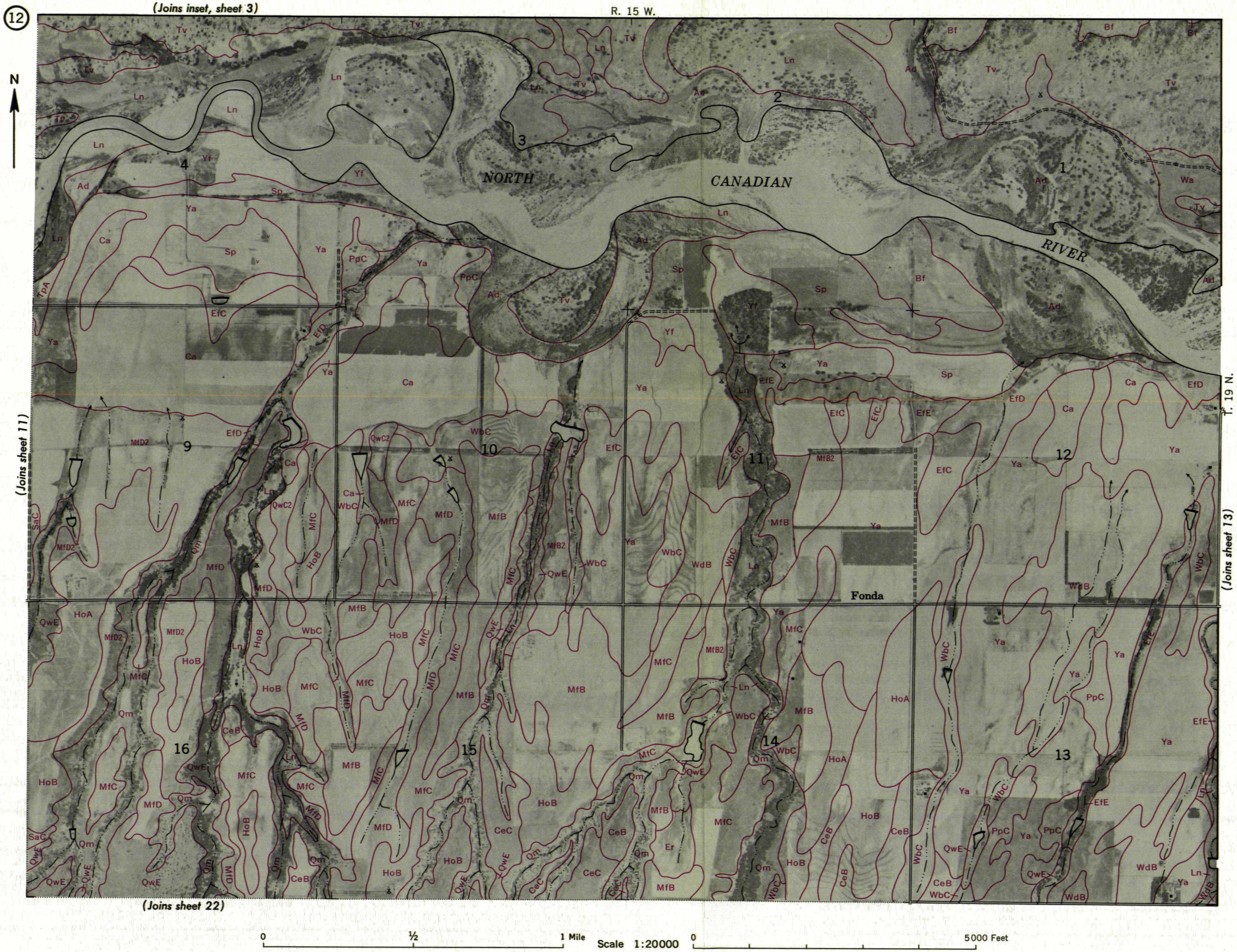
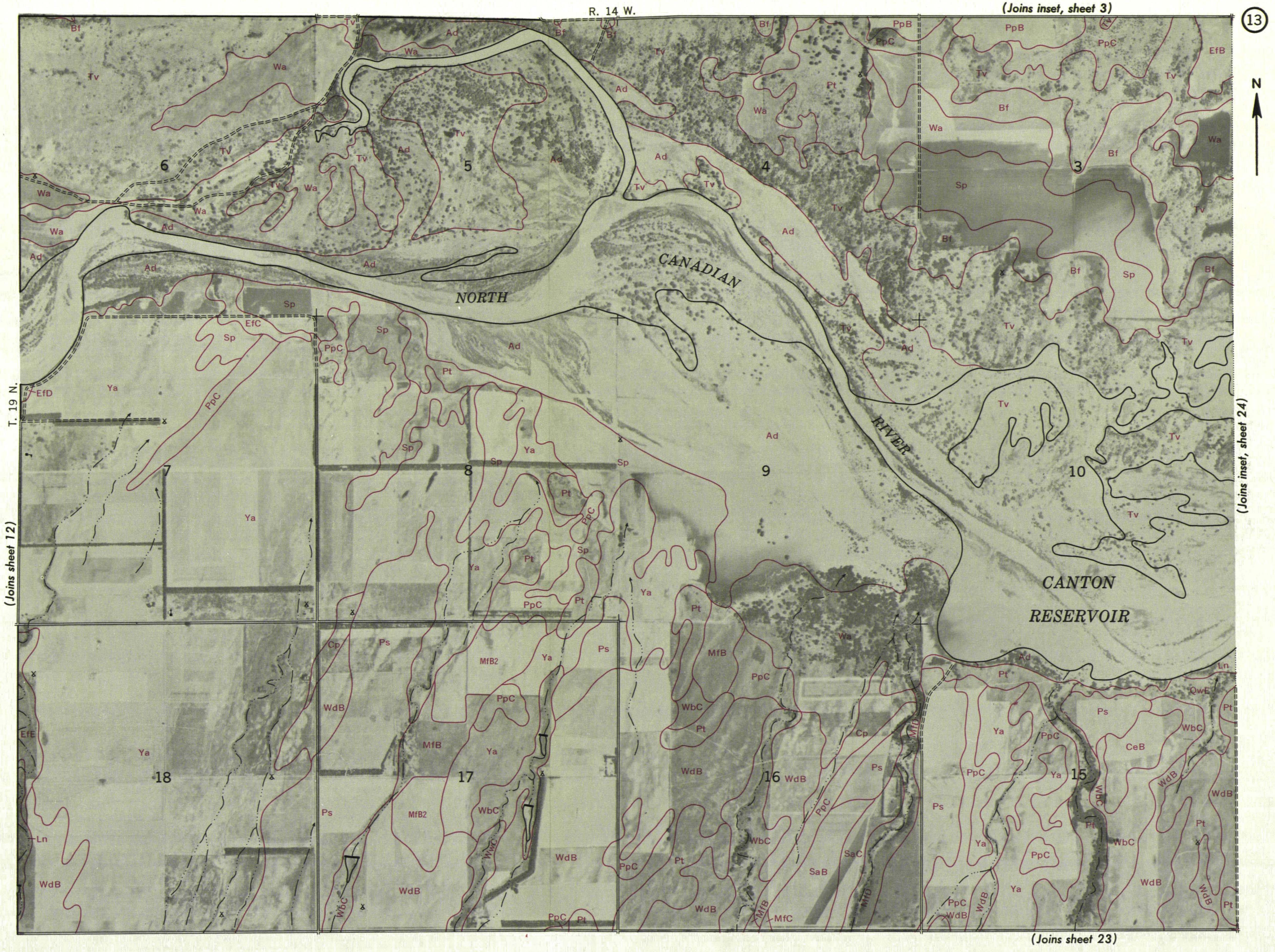


0 ½ 1 Mile Scale 1:20000 0 5000 Feet


12
(Joins inset, sheet 3)
R. 15 W.
N
NORTH CANADIAN RIVER
T. 19 N.
(Joins sheet 11)
(Joins sheet 13)
(Joins sheet 22)
Fonda
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet



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Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1:20000 0 5000 Feet


14
(Joins sheet 4)
R. 20 W.
N
ELLIS COUNTY
T. 19 N.
(Joins sheet 15)
(Joins sheet 25)
19
20
21
22
27
28
29
30
31
32
33
34
0
½
1 Mile
Scale 1:20000
0
5000 Feet

15

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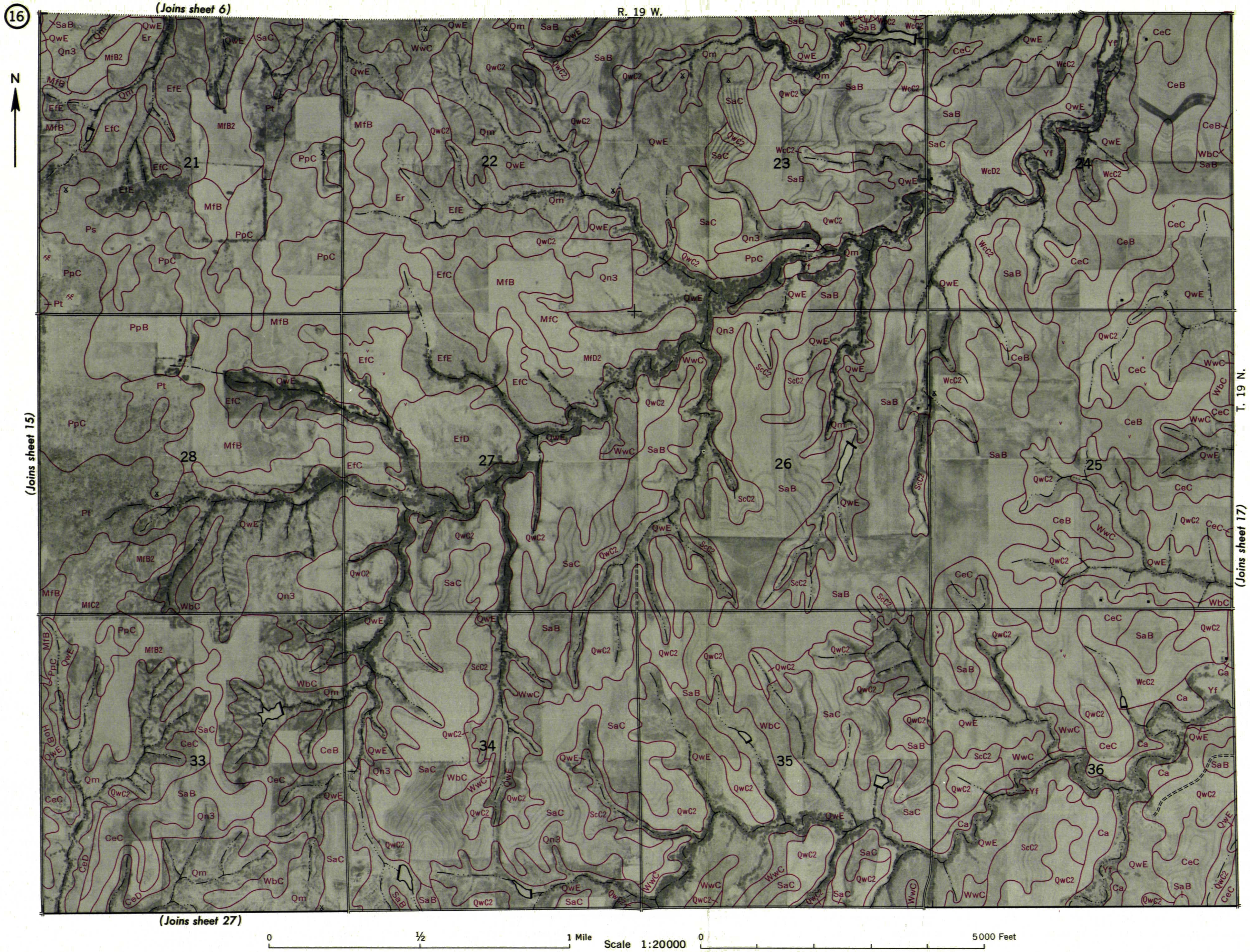
0 ½ 1 Mile Scale 1:20000 0 5000 Feet


16
(Joins sheet 6)
R. 19 W.
N
(Joins sheet 15)
T. 19 N.
(Joins sheet 17)
(Joins sheet 27)
21
22
23
24
28
27
26
25
33
34
35
36
0
½
1 Mile
Scale 1:20000
0
5000 Feet

17

R. 18 W.

(Joins sheet 7)

T. 19 N.

(Joins sheet 16)

(Joins sheet 18)

(Joins sheet 28)

0 ½ 1 Mile

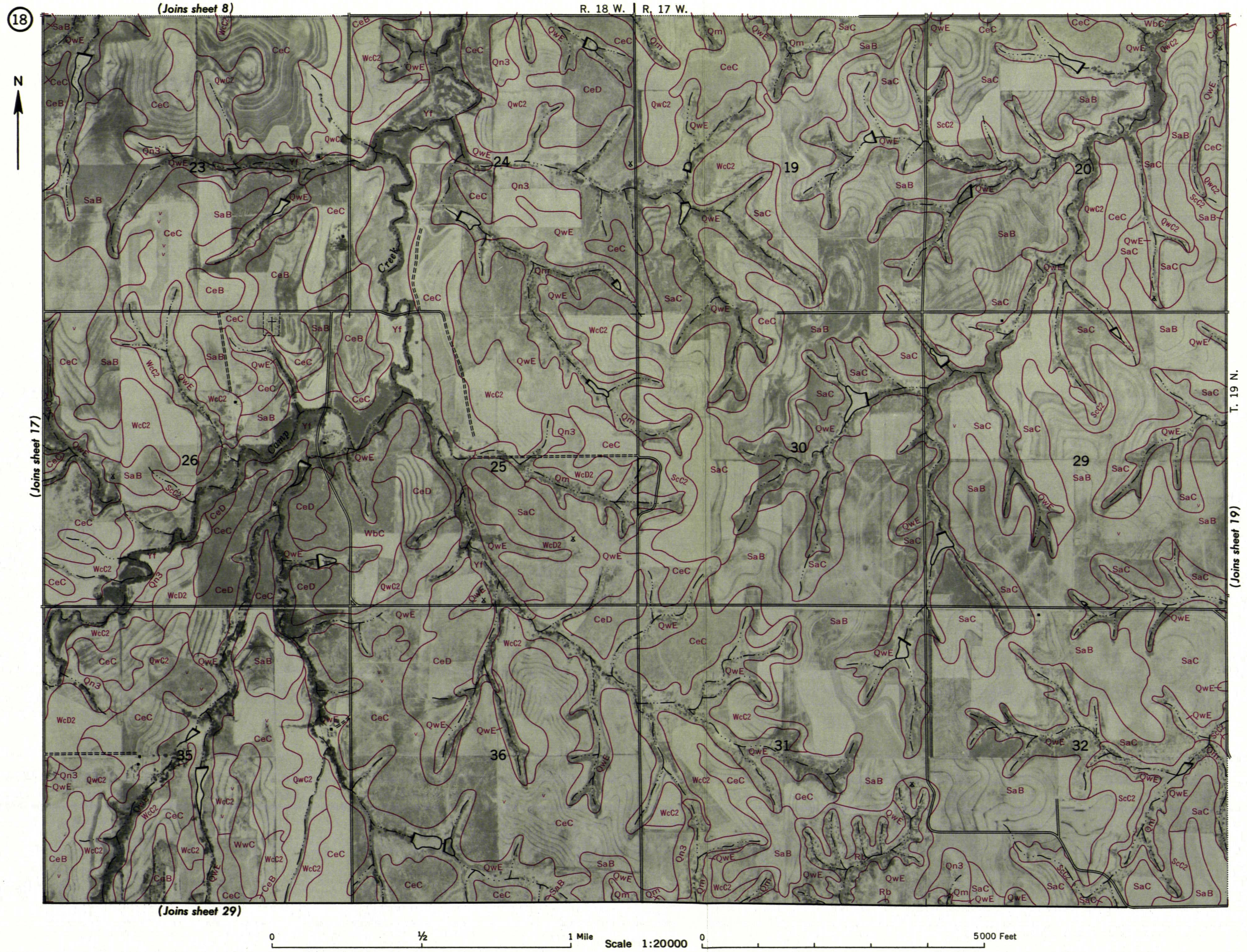
Scale 1:20000

0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 18

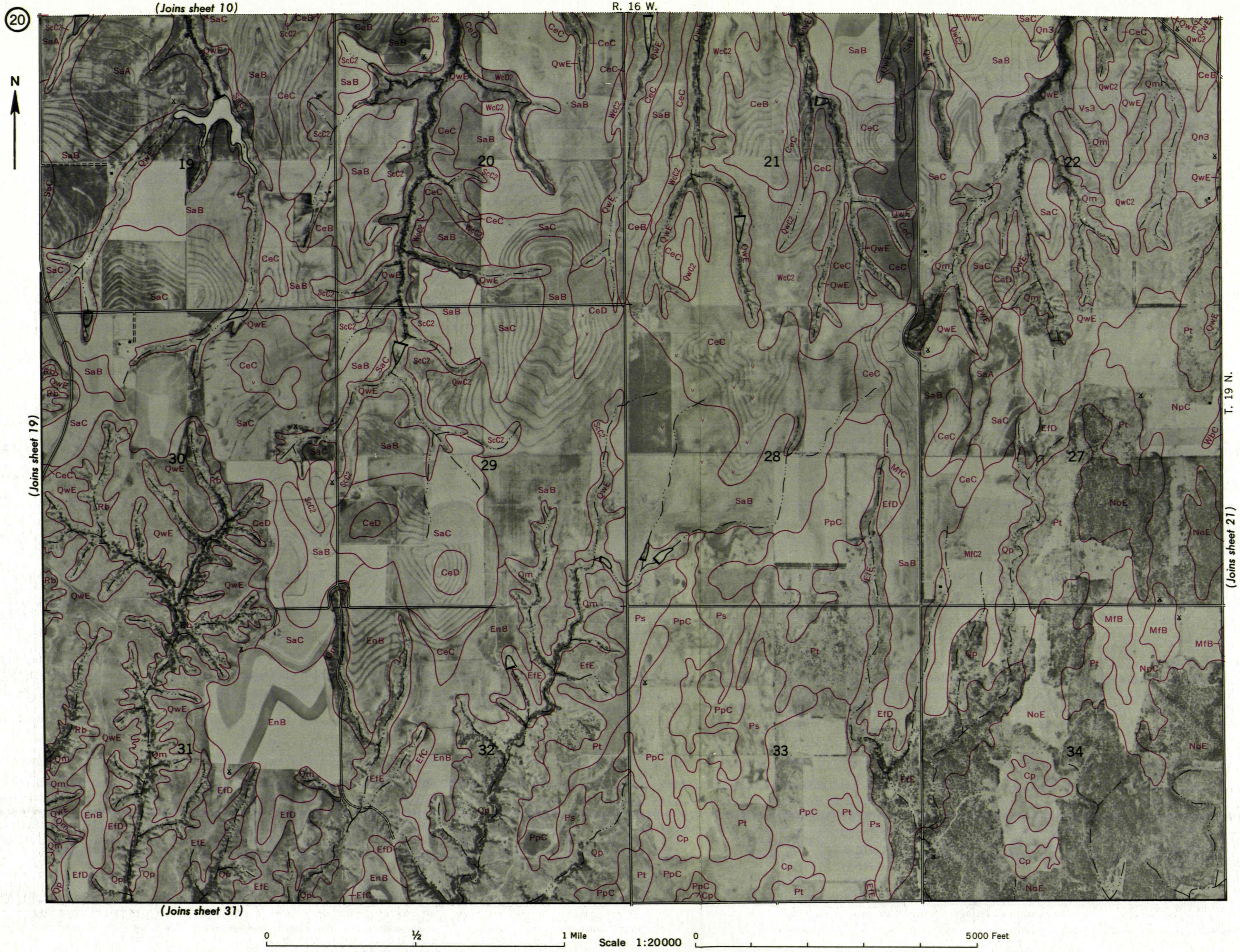


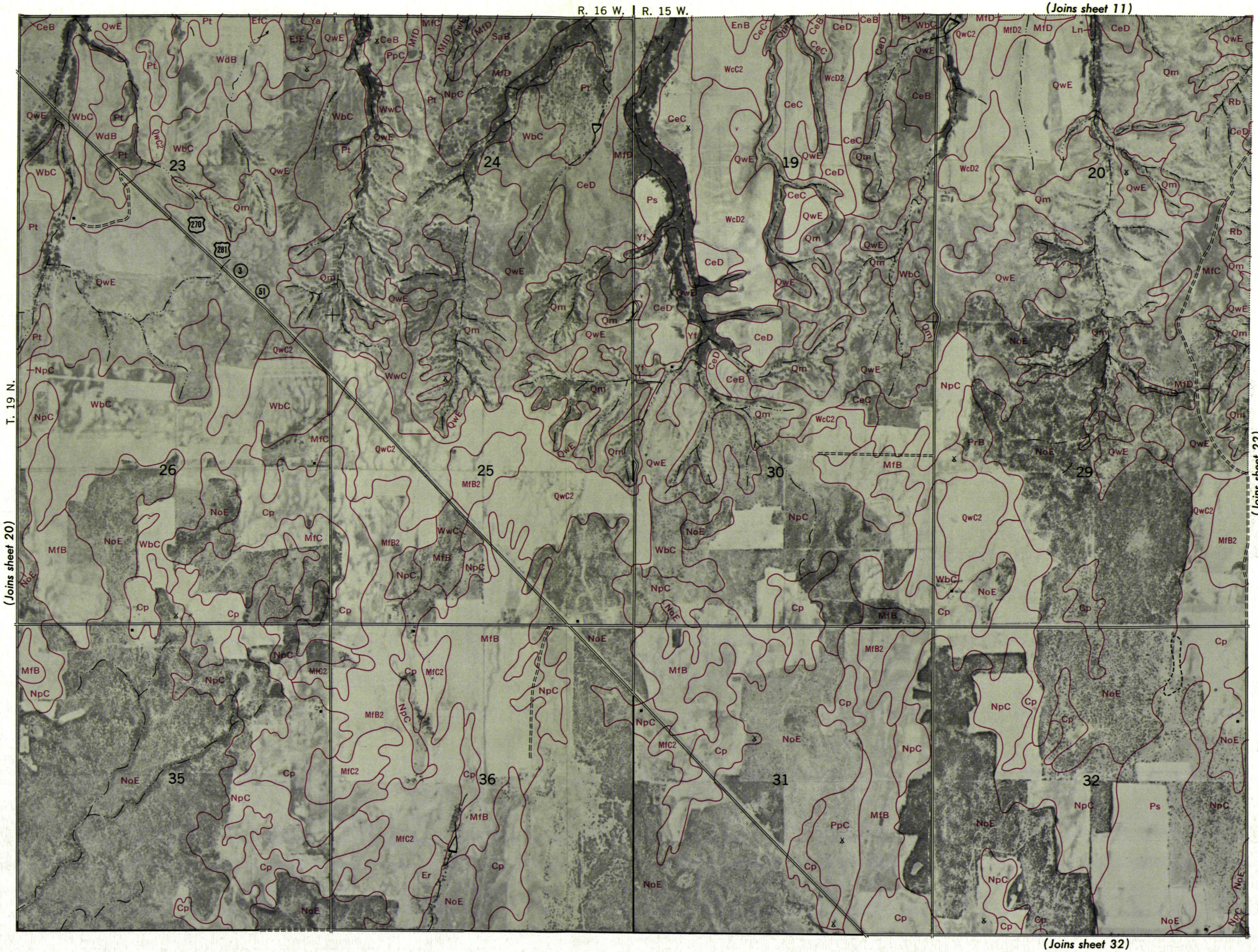
This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 20





Scale 1:20000

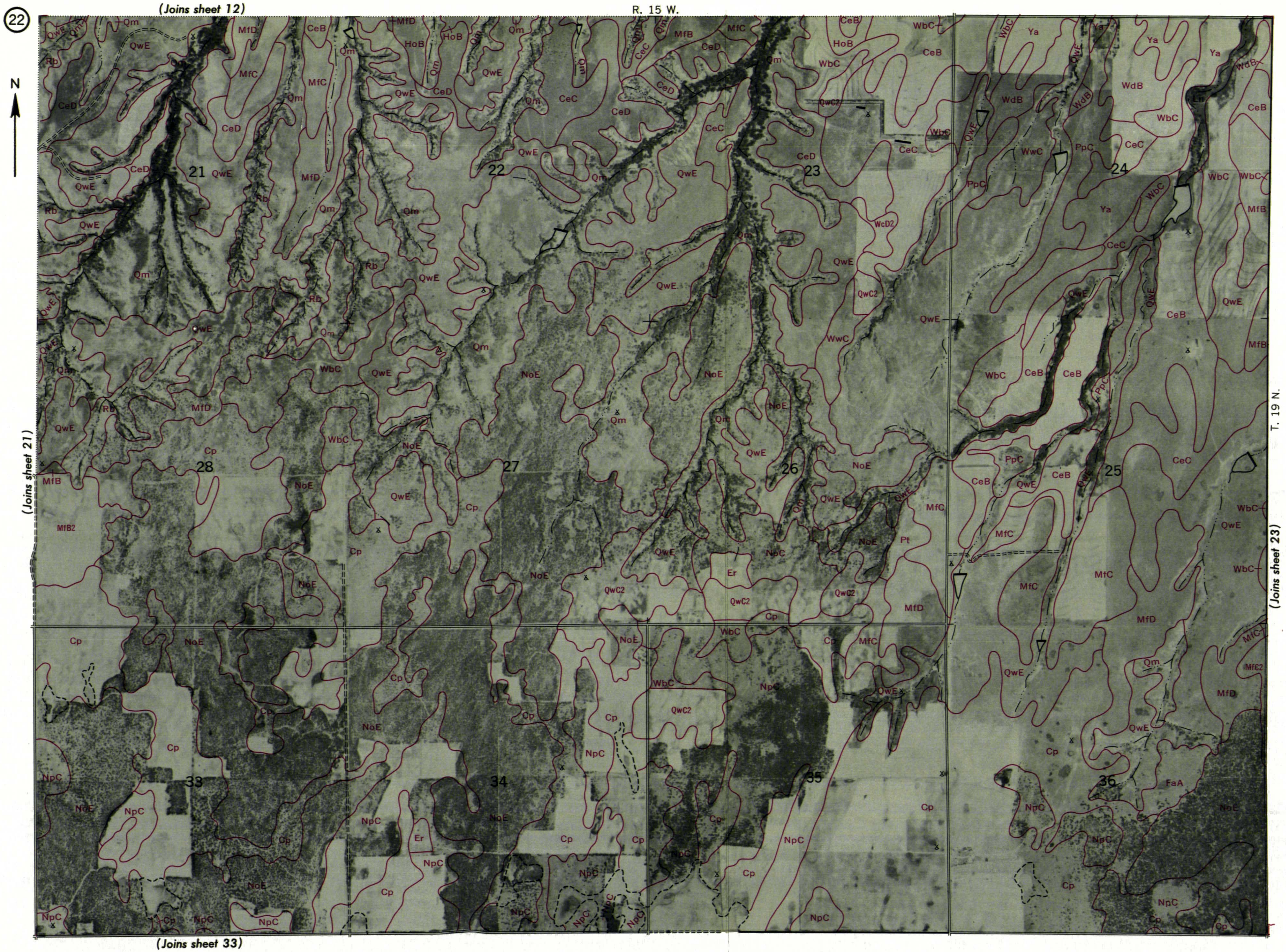
0 ½ 1 Mile

0 5000 Feet

Range, township, and section corners shown on this map are indefinite.

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

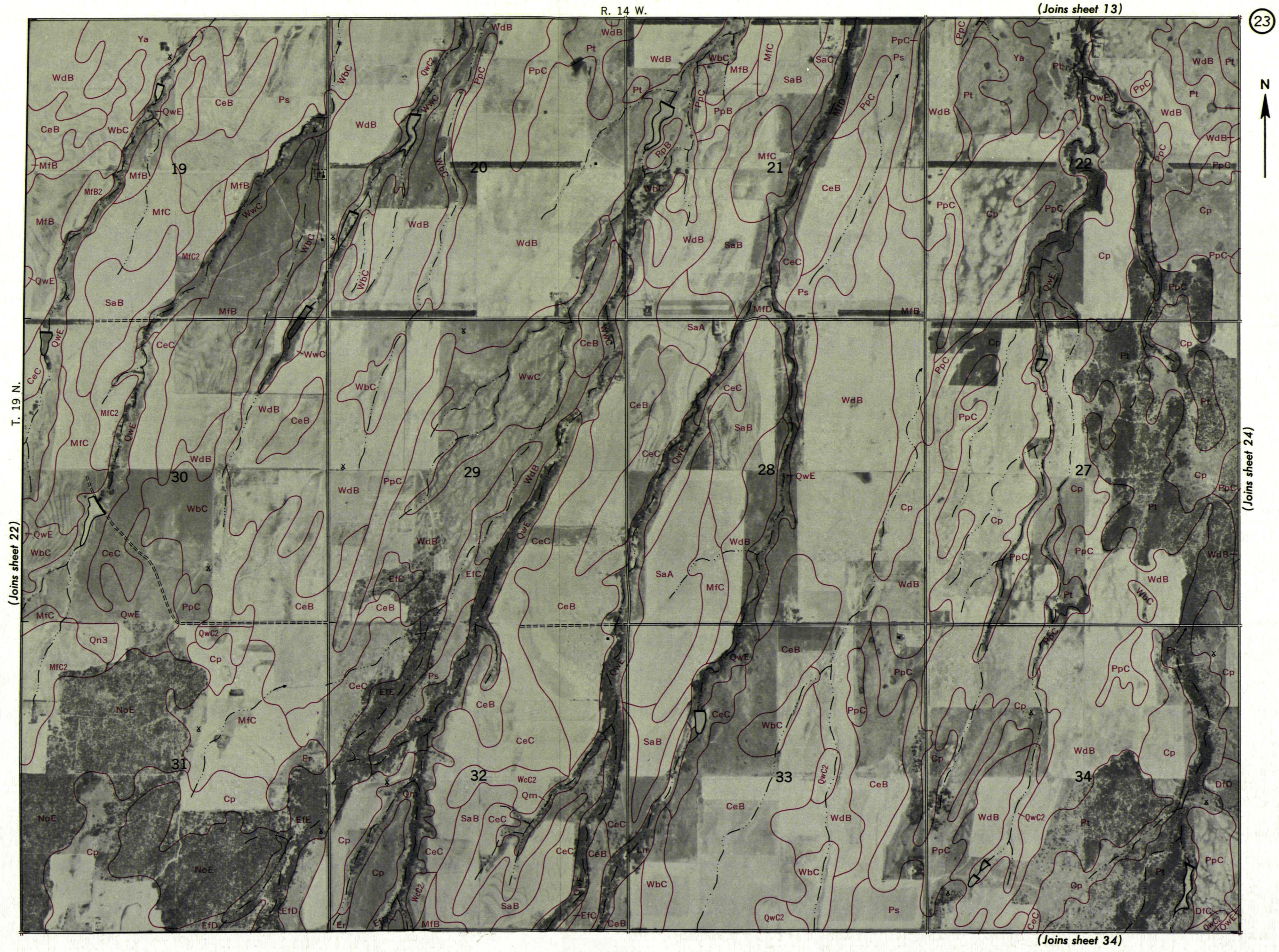
DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 22



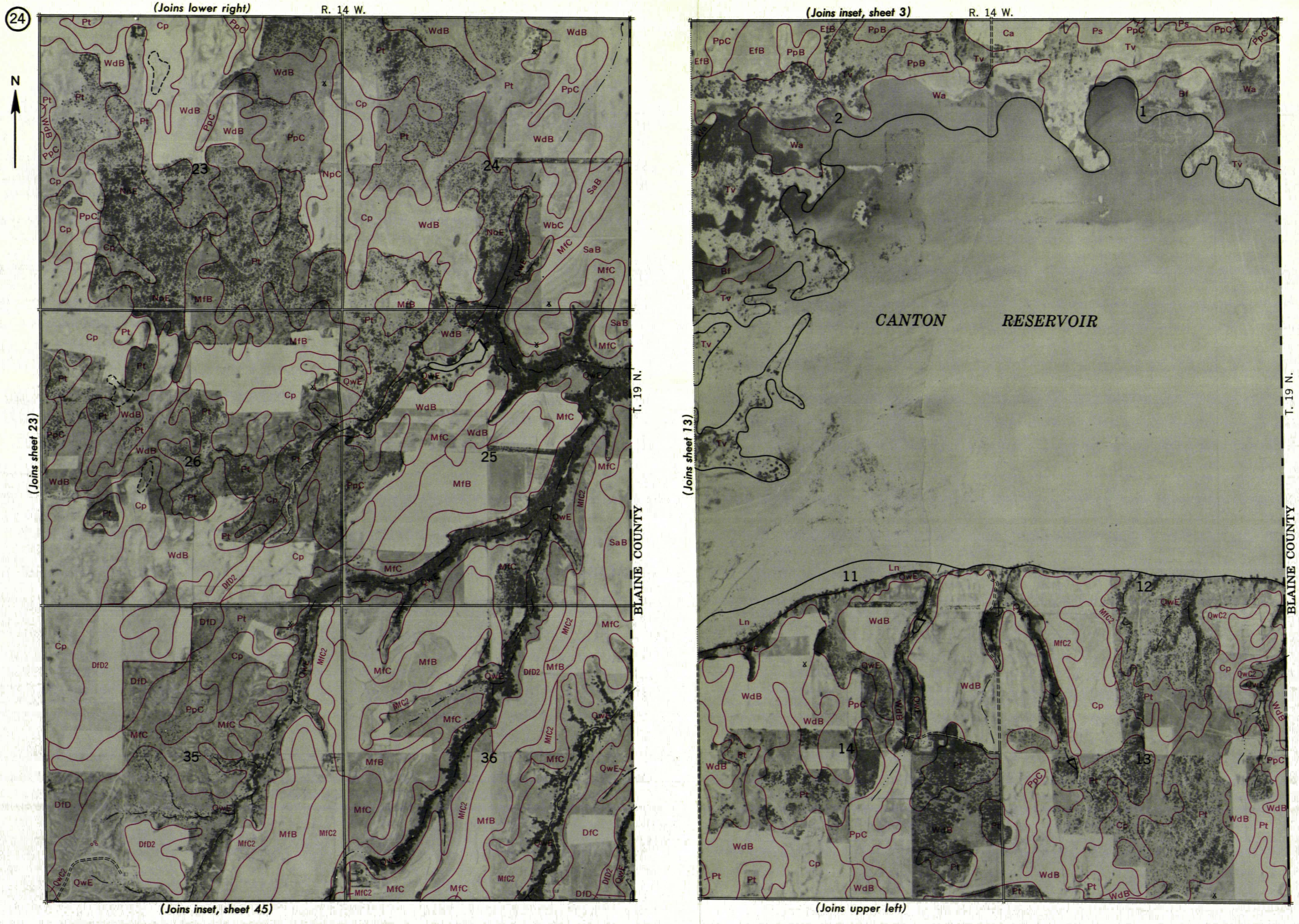
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.



0 ½ 1 Mile Scale 1:20000 0 5000 Feet



0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

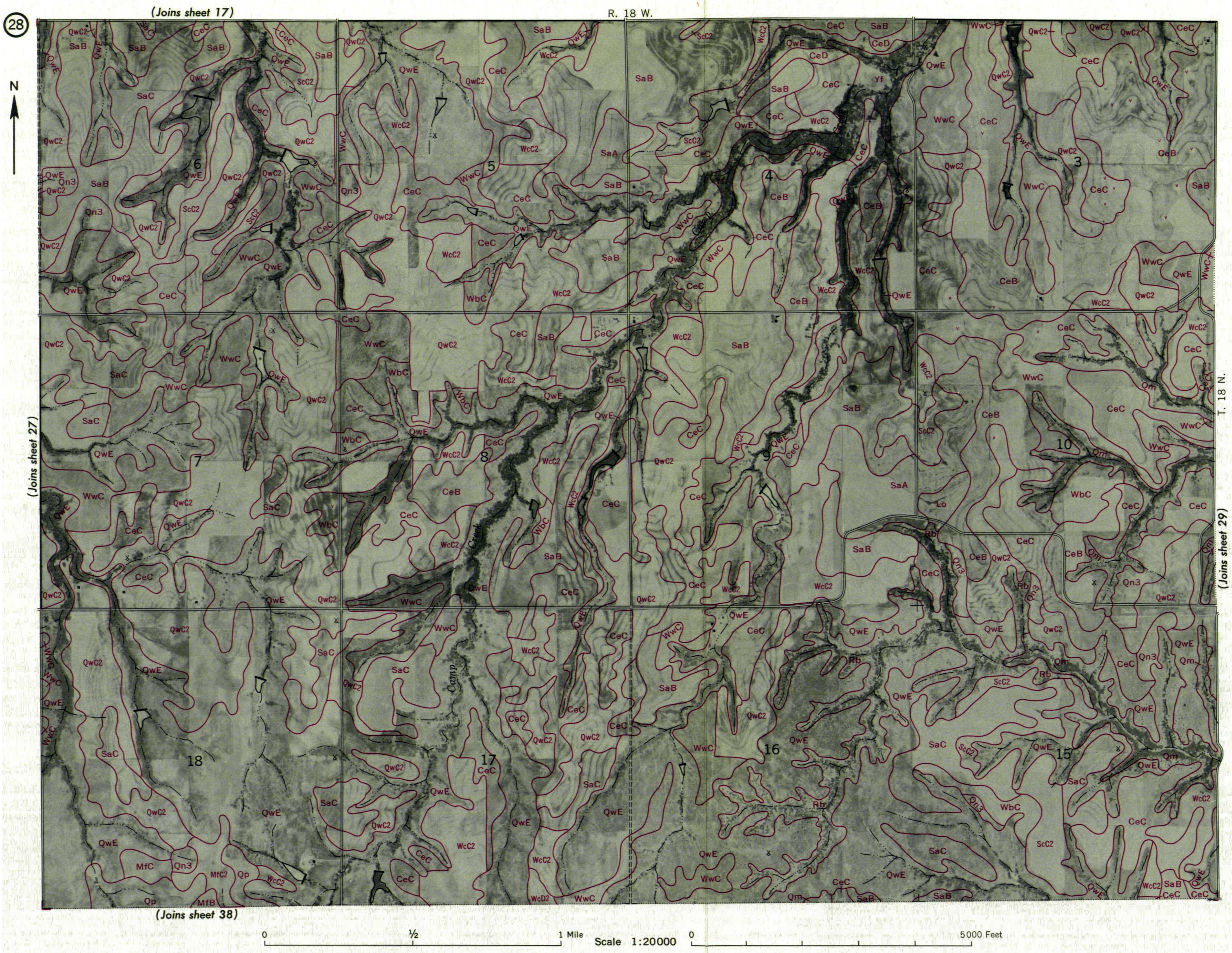
Range, township, and section corners shown on this map are indefinite.

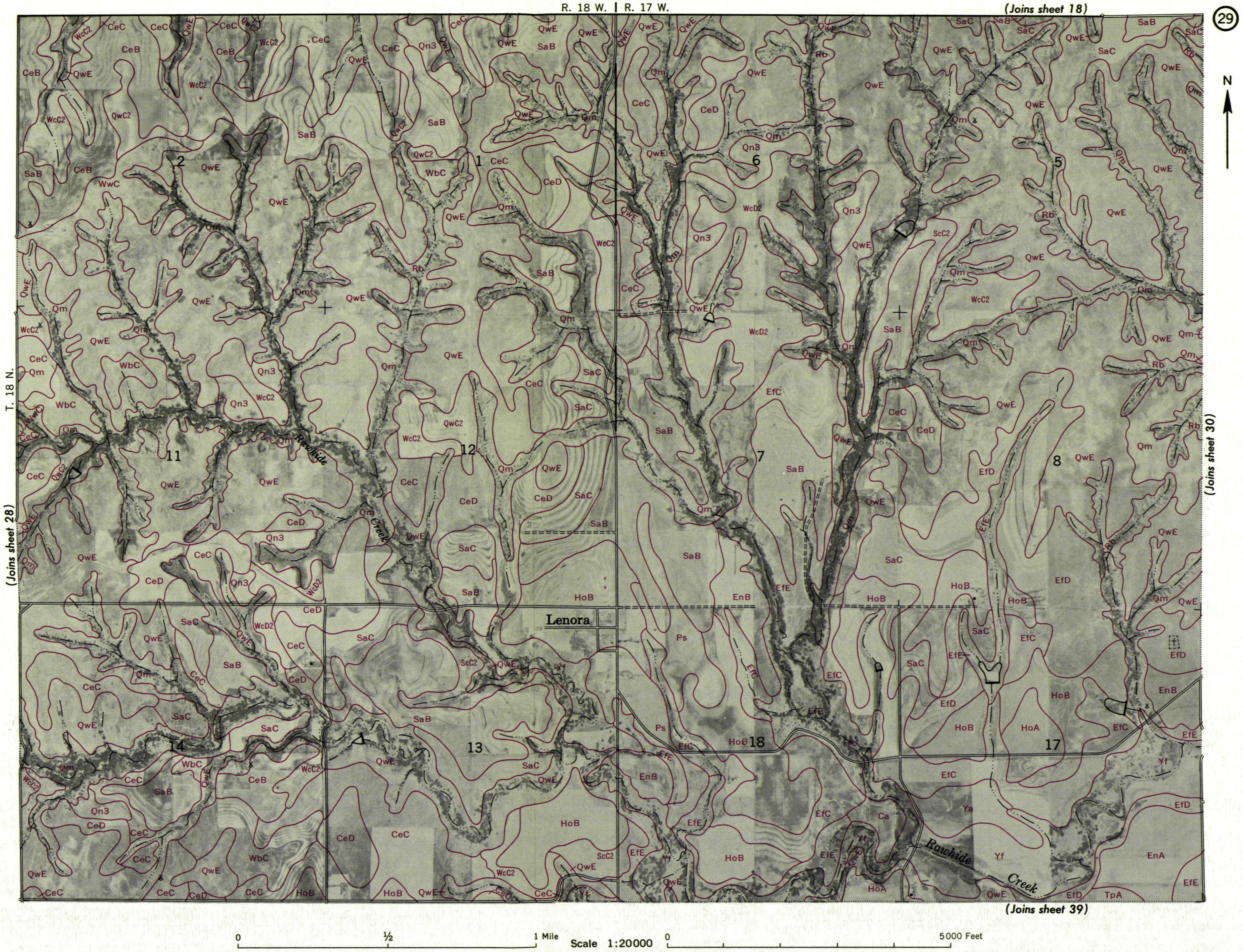
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

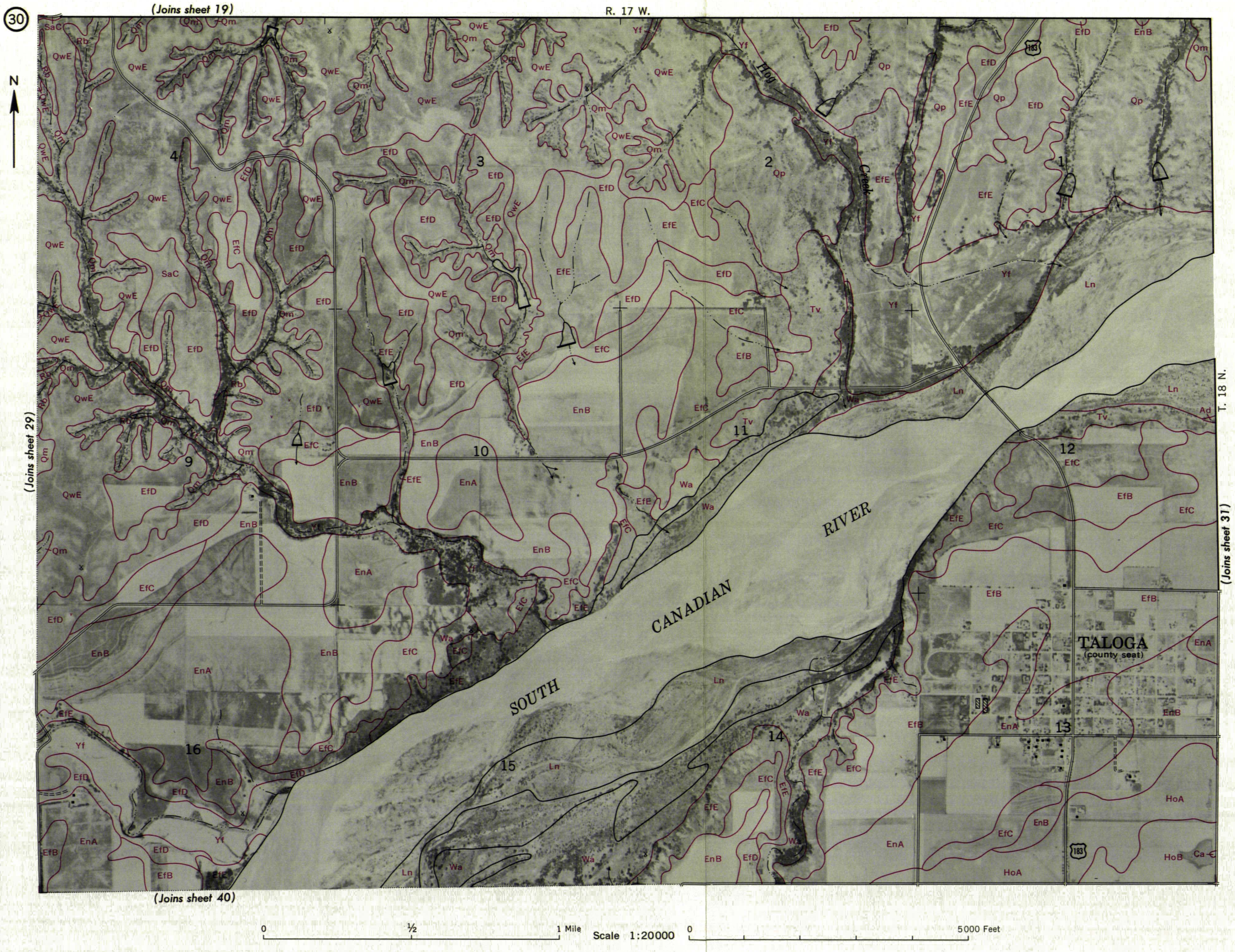
Range, township, and section corners shown on this map are indefinite.


28
(Joins sheet 17)
R. 18 W.
N
(Joins sheet 27)
(Joins sheet 29)
T. 18 N.
(Joins sheet 38)
0
½
1 Mile
Scale 1:20000
0
5000 Feet



This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

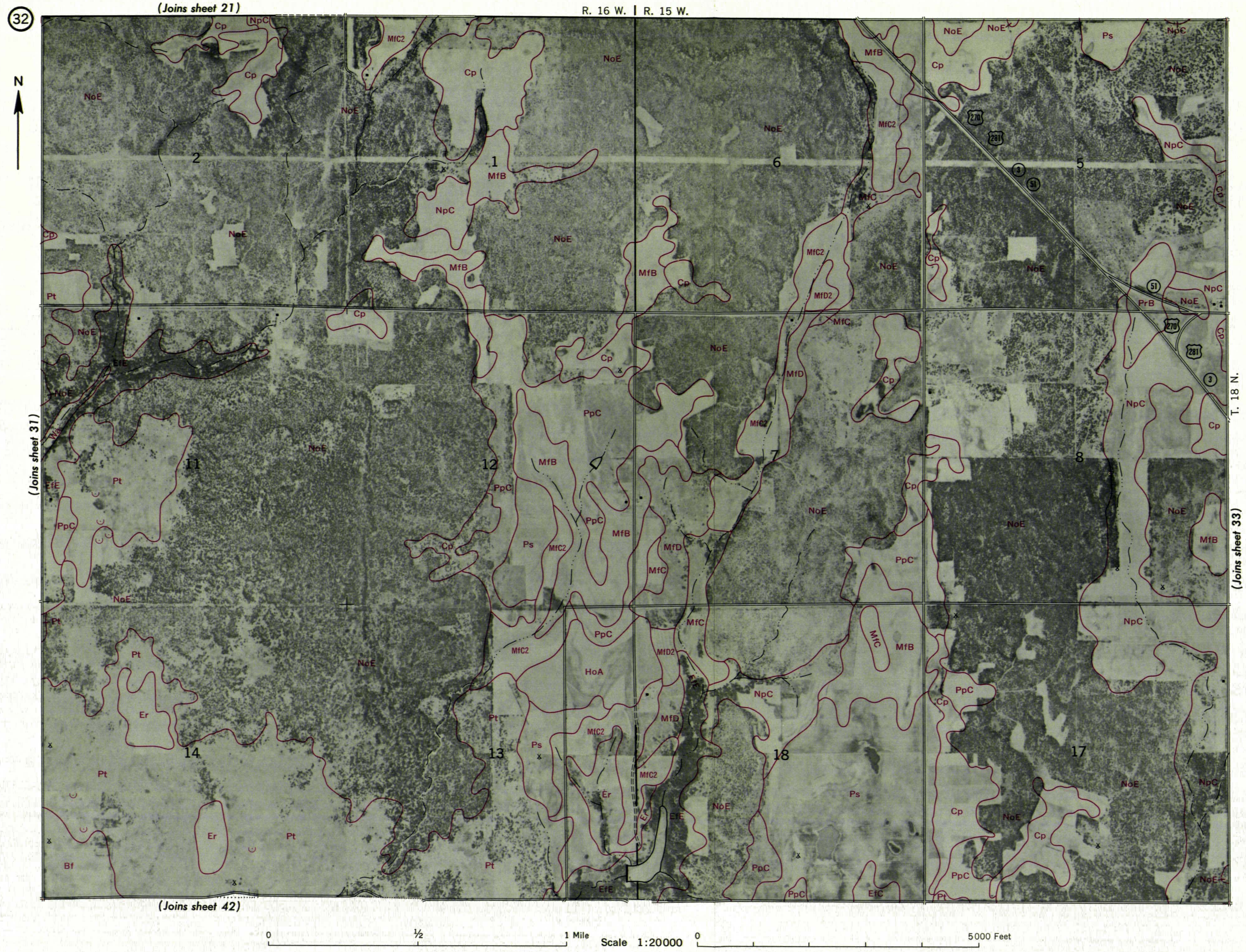
Range, township, and section corners shown on this map are indefinite.


30
(Joins sheet 19)
R. 17 W.
N
(Joins sheet 29)
(Joins sheet 31)
(Joins sheet 40)
T. 18 N.
Hog Creek
SOUTH CANADIAN RIVER
TALOGA
(county seat)
183
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

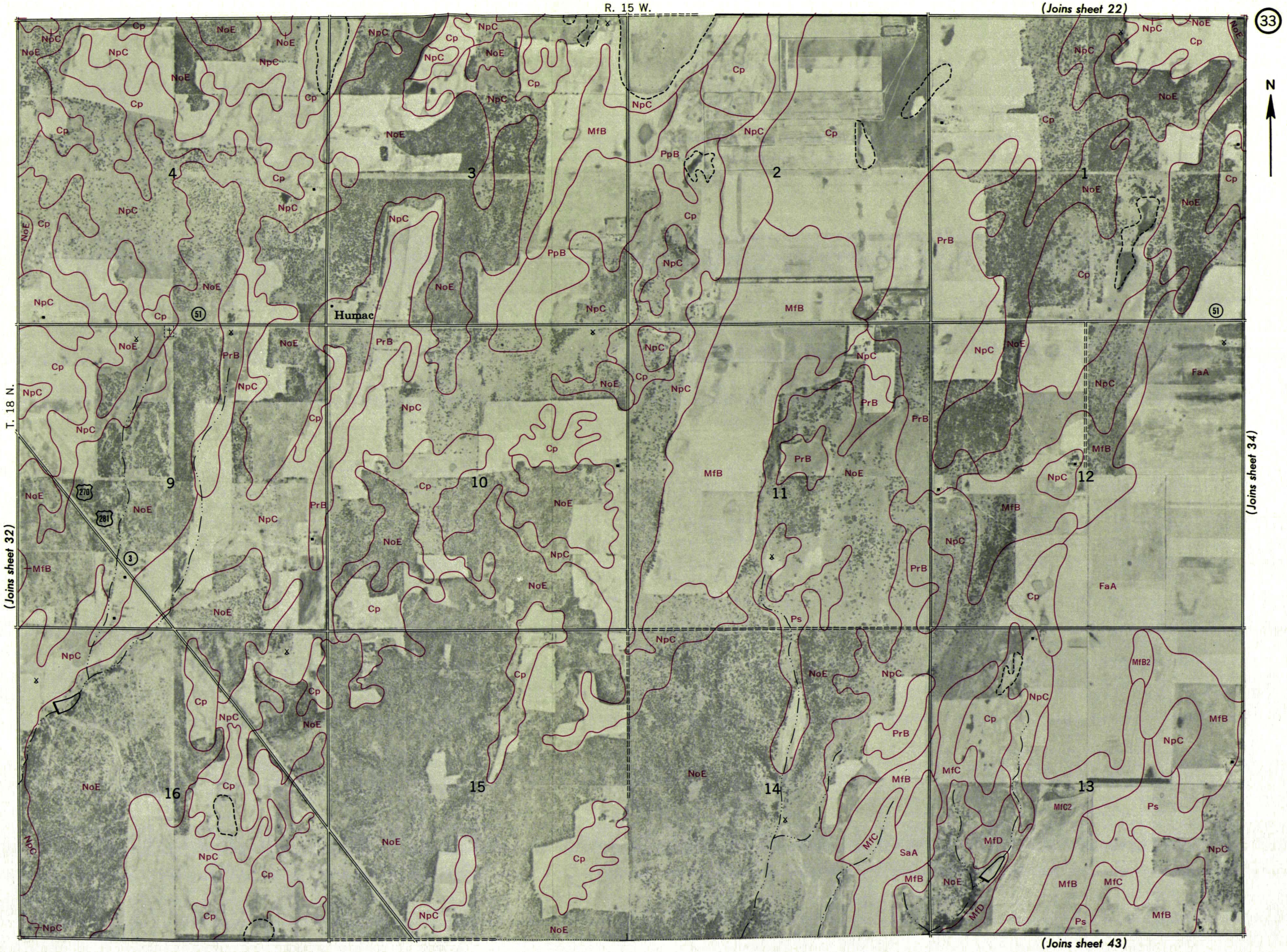
This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.


32
N
(Joins sheet 21)
R. 16 W.
R. 15 W.
T. 18 N.
(Joins sheet 31)
(Joins sheet 33)
(Joins sheet 42)
2
1
6
5
11
12
7
8
14
13
18
17
Cp
NpC
MfC2
NoE
MfB
Ps
NpC
Pt
PrB
EfE
PpC
MfD
MfC
MfD2
HoA
Er
Bf
EfC
0
½
1 Mile
Scale 1:20000
0
5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

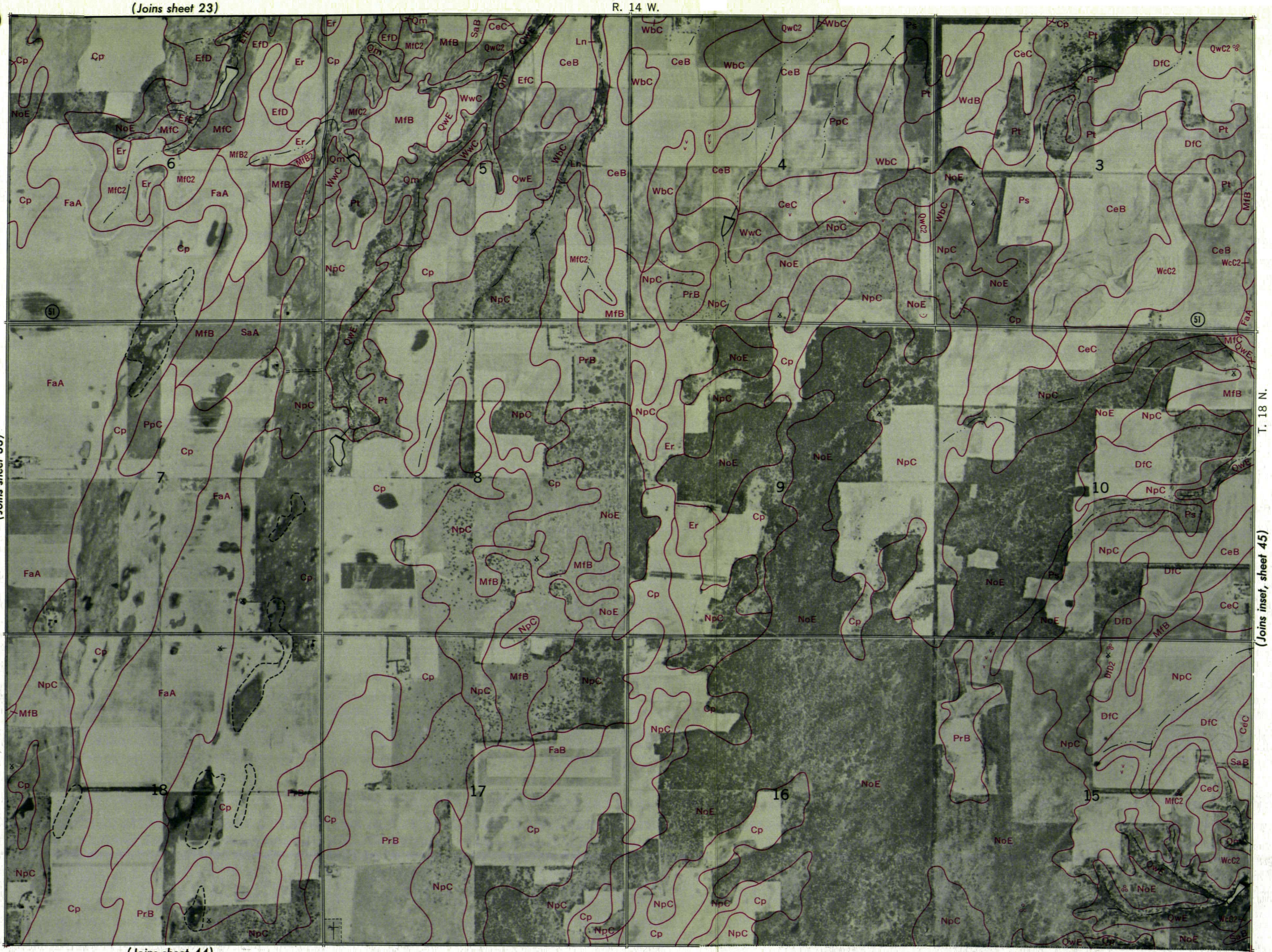
Range, township, and section corners shown on this map are indefinite.



0 ½ 1 Mile Scale 1:20000 0 5000 Feet

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 34

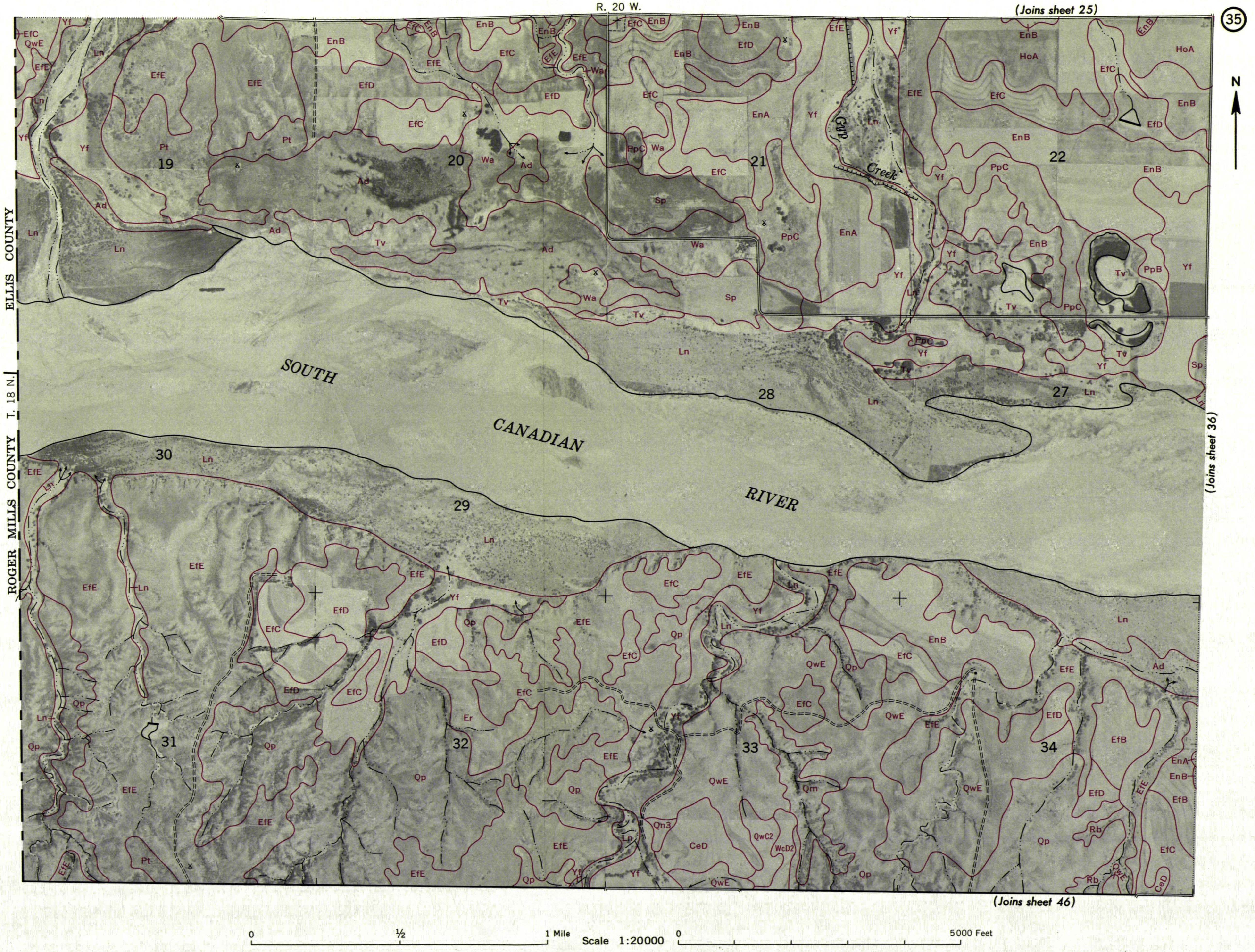
34

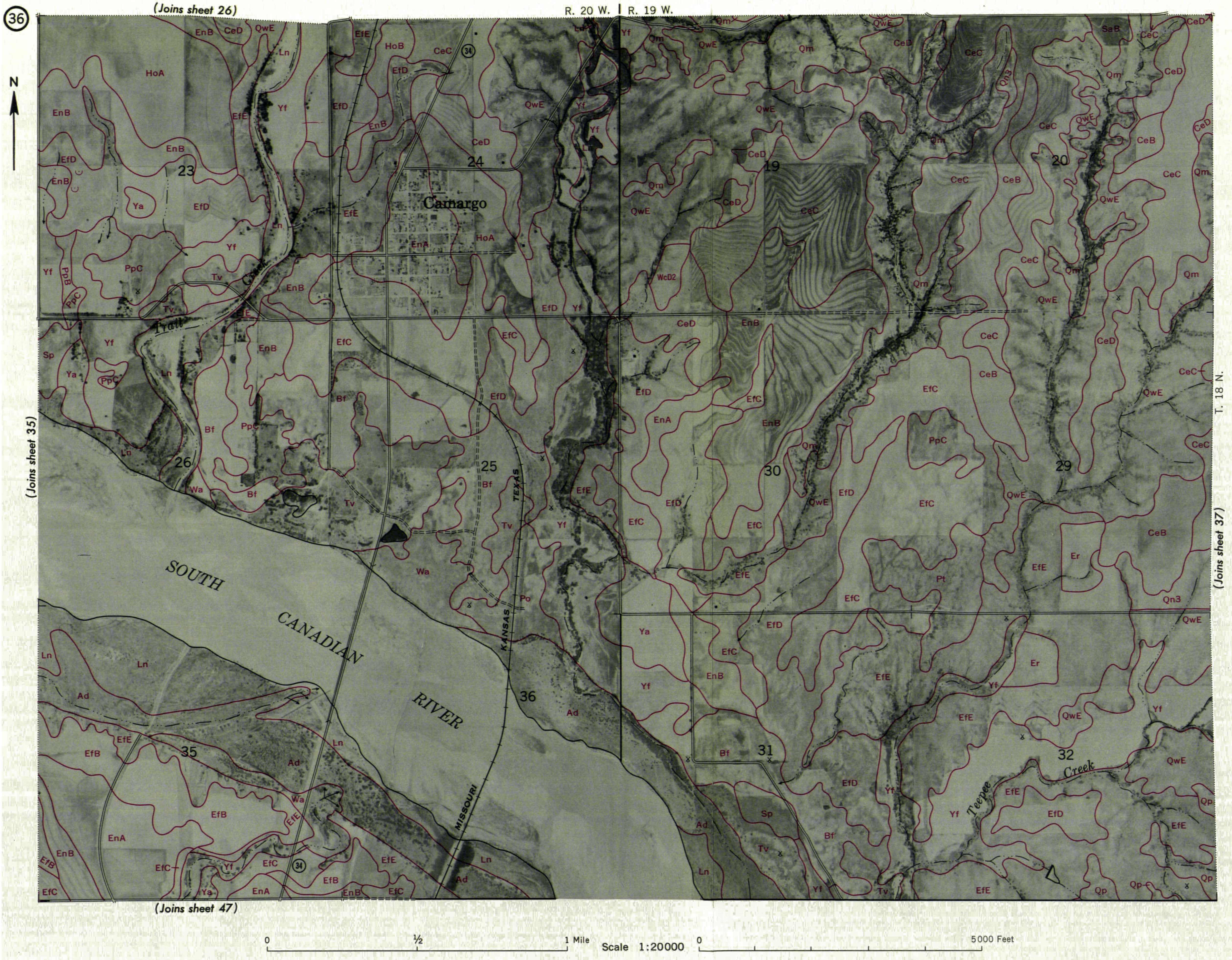


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.




36
(Joins sheet 26)
R. 20 W. | R. 19 W.
N
(Joins sheet 35)
(Joins sheet 37)
(Joins sheet 47)
T. 18 N.
Camargo
SOUTH
CANADIAN
RIVER
Teepee
Creek
Trail
KANSAS
TEXAS
MISSOURI
19
20
23
24
25
26
29
30
31
32
35
36
0
½
1 Mile
Scale 1:20000
0
5000 Feet

Scale 1:20000

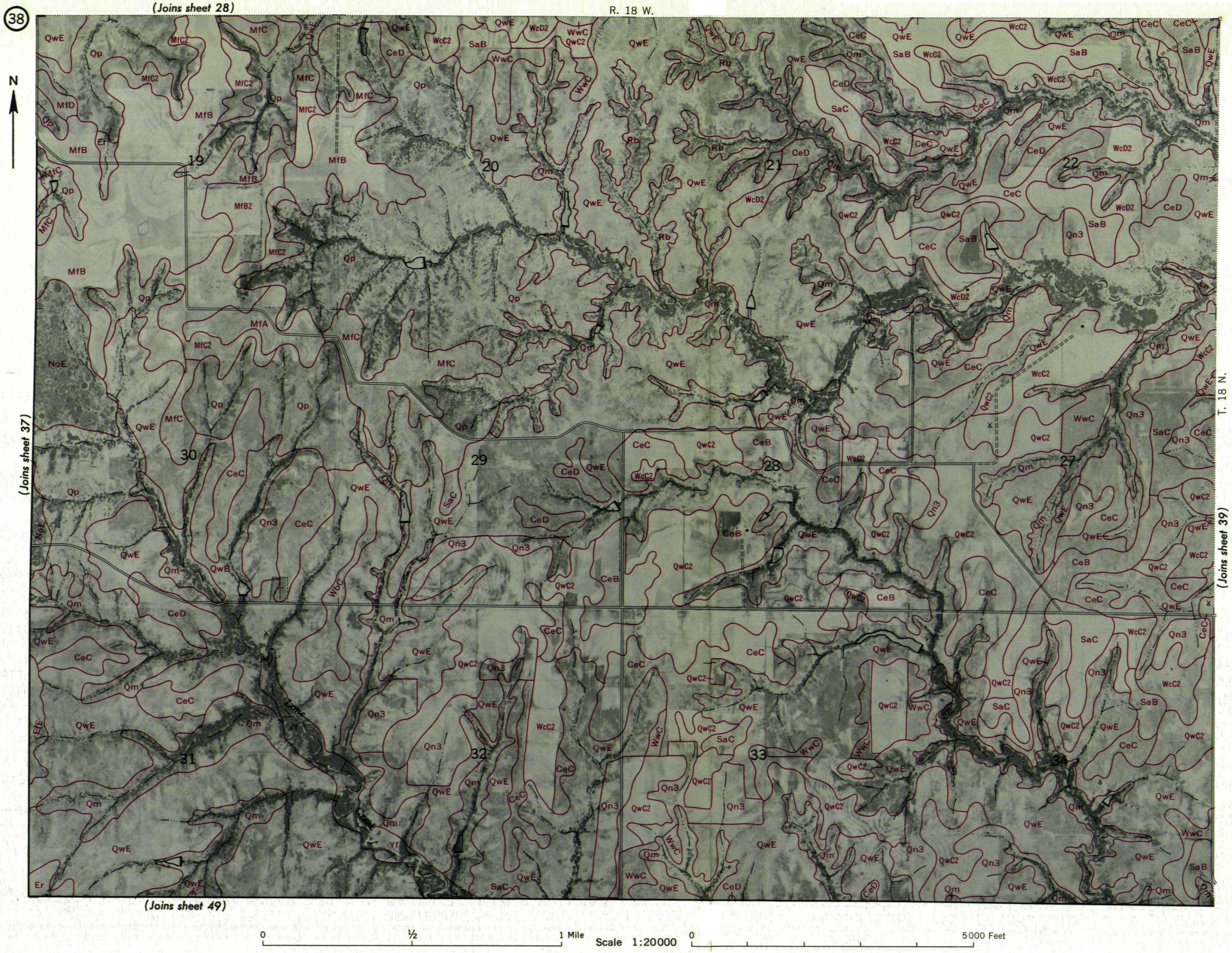
0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 38



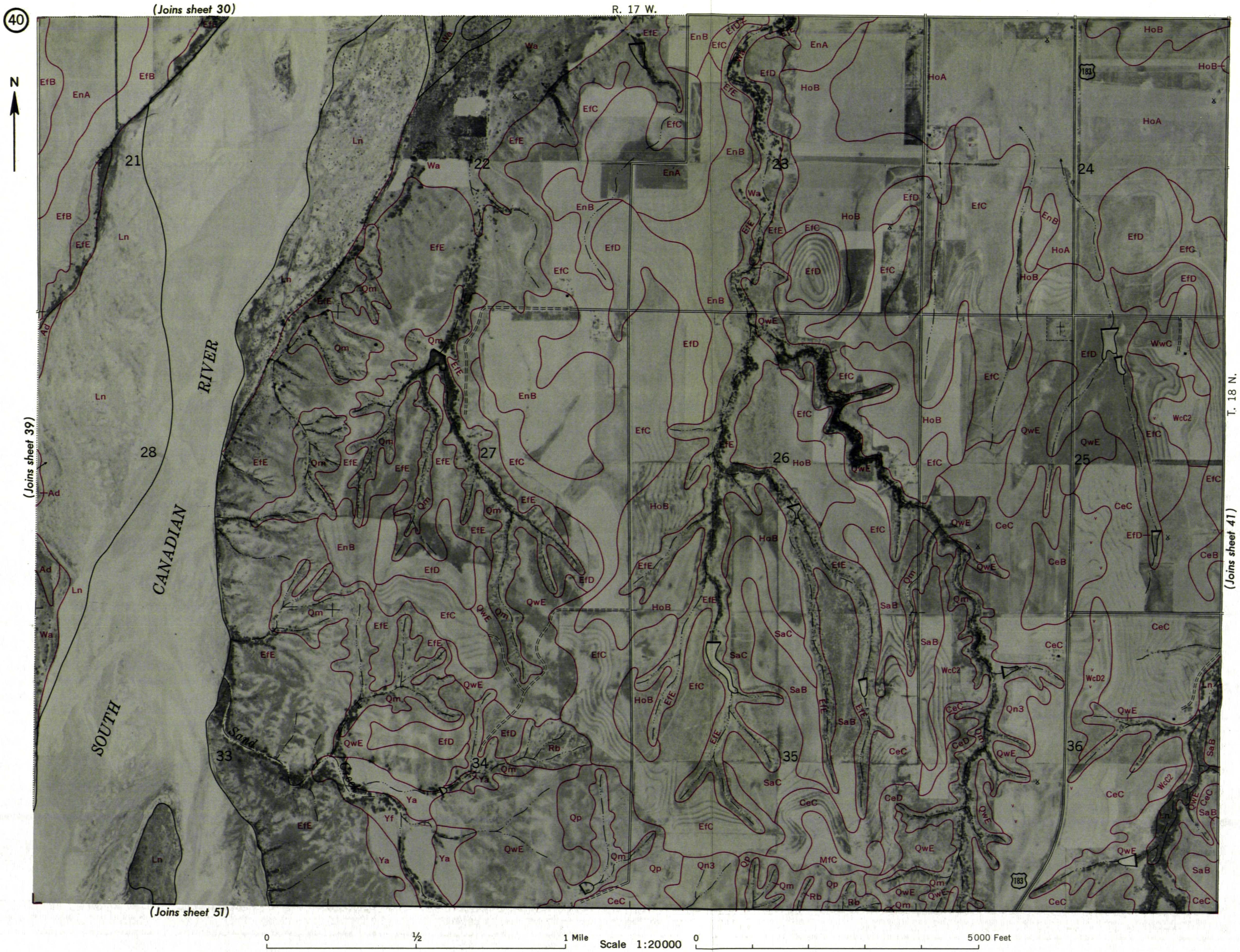
This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

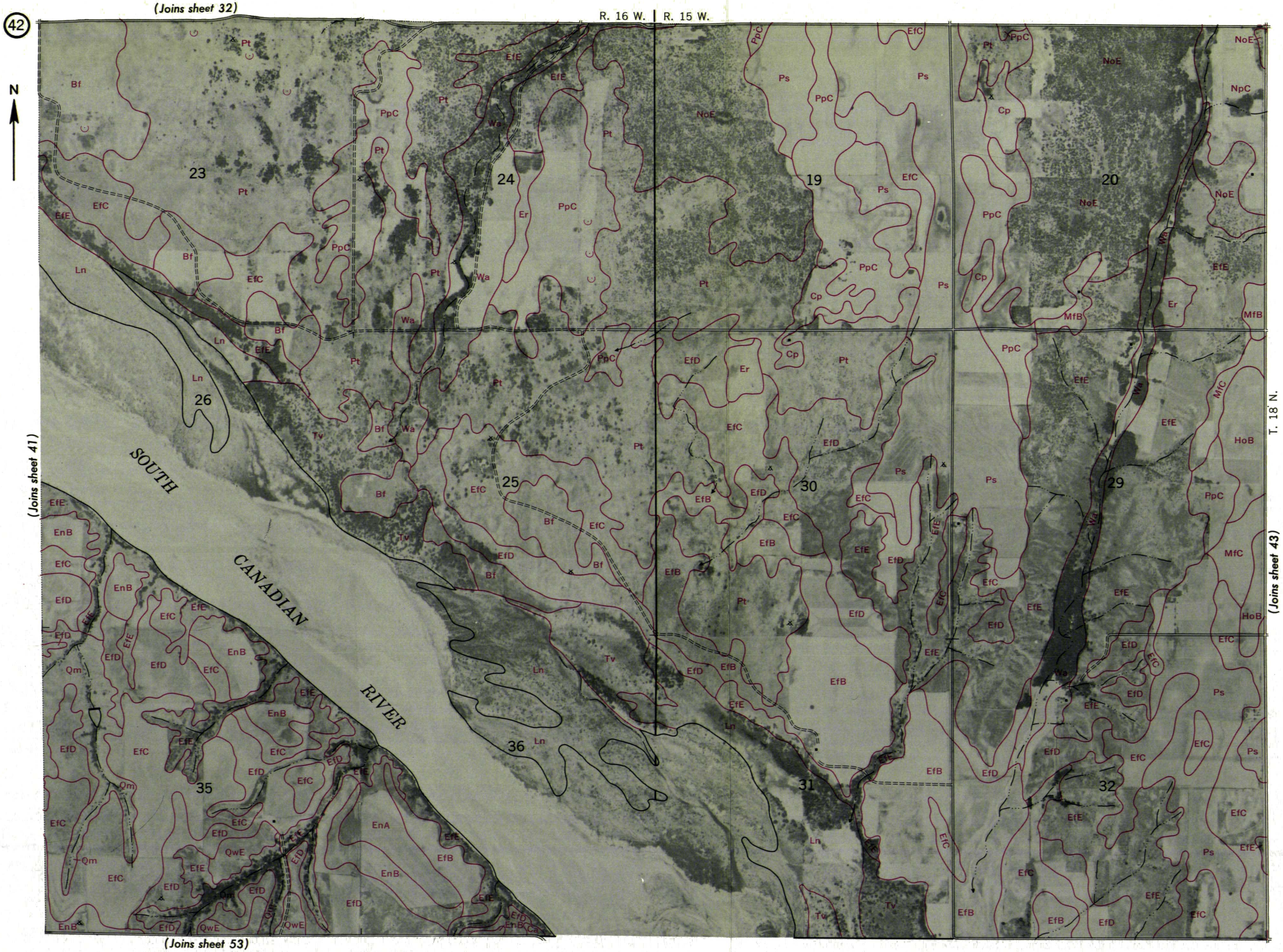

40
(Joins sheet 30)
R. 17 W.
N
(Joins sheet 39)
(Joins sheet 41)
T. 18 N.
(Joins sheet 51)
SOUTH CANADIAN RIVER
Sand
21
22
23
24
25
26
27
28
33
34
35
36
0
½
1 Mile
Scale 1:20000
0
5000 Feet

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 41

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1:20000 0 5000 Feet



0 ½ 1 Mile Scale 1:20000 0 5000 Feet

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

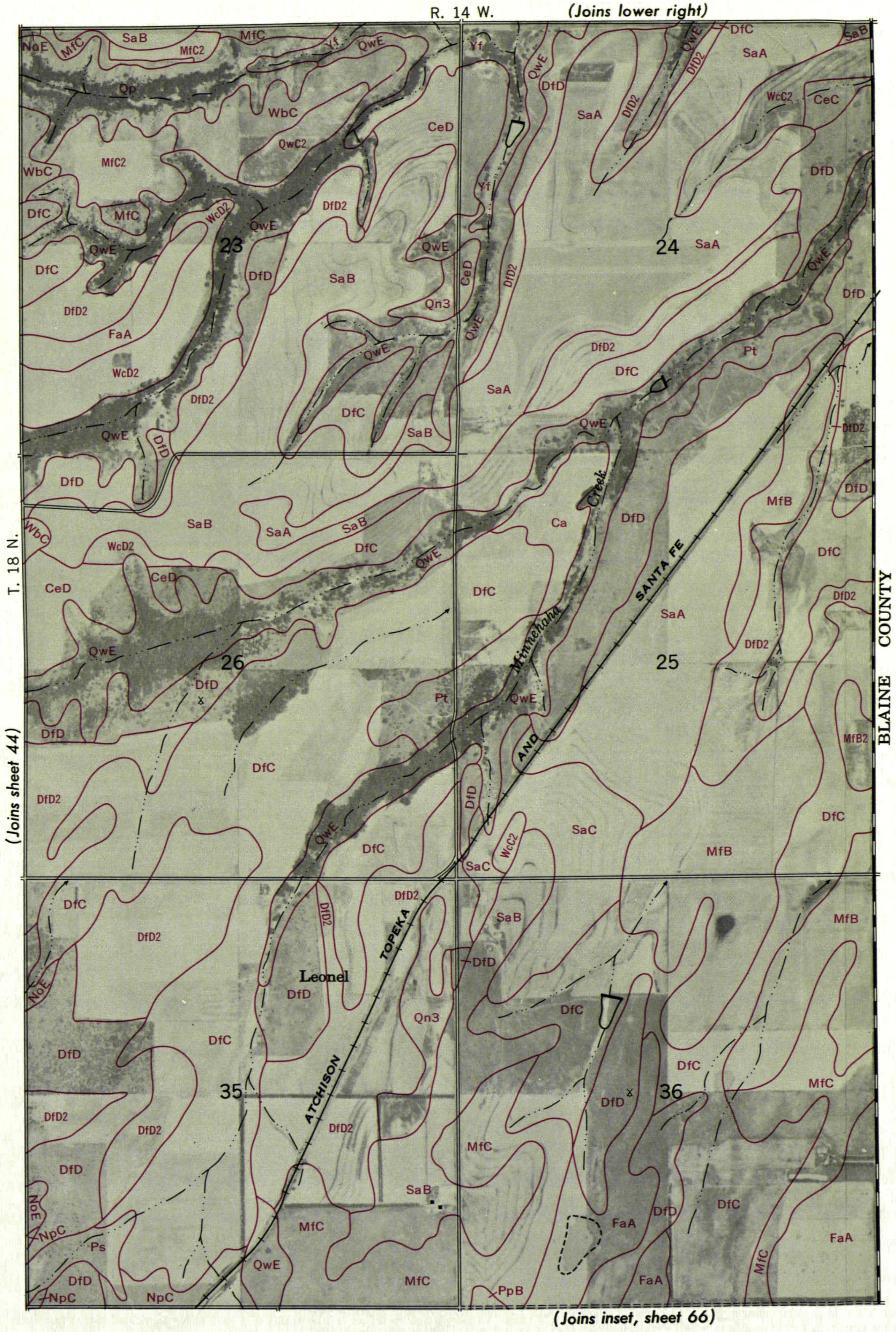
Range, township, and section corners shown on this map are indefinite.

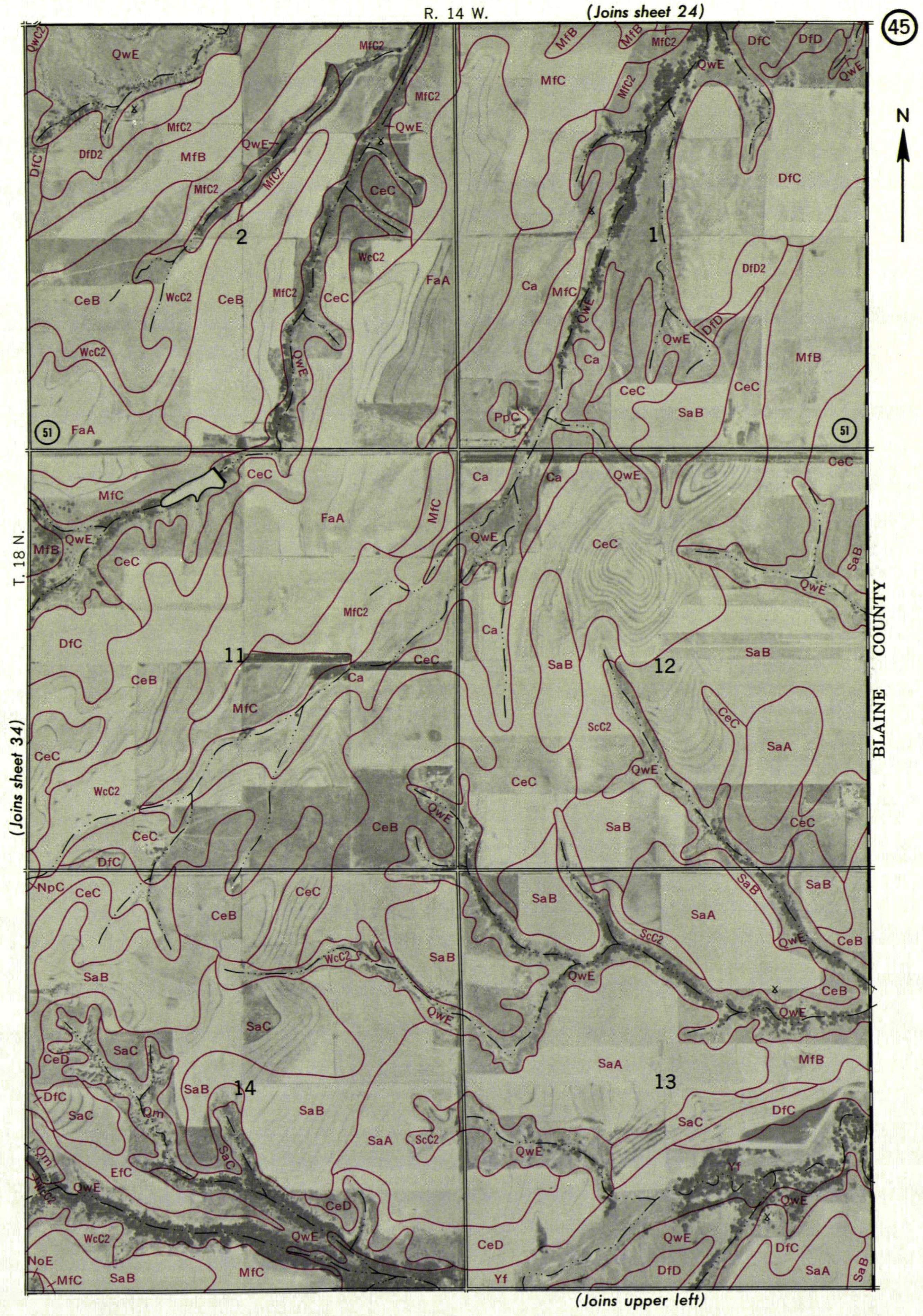
44

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

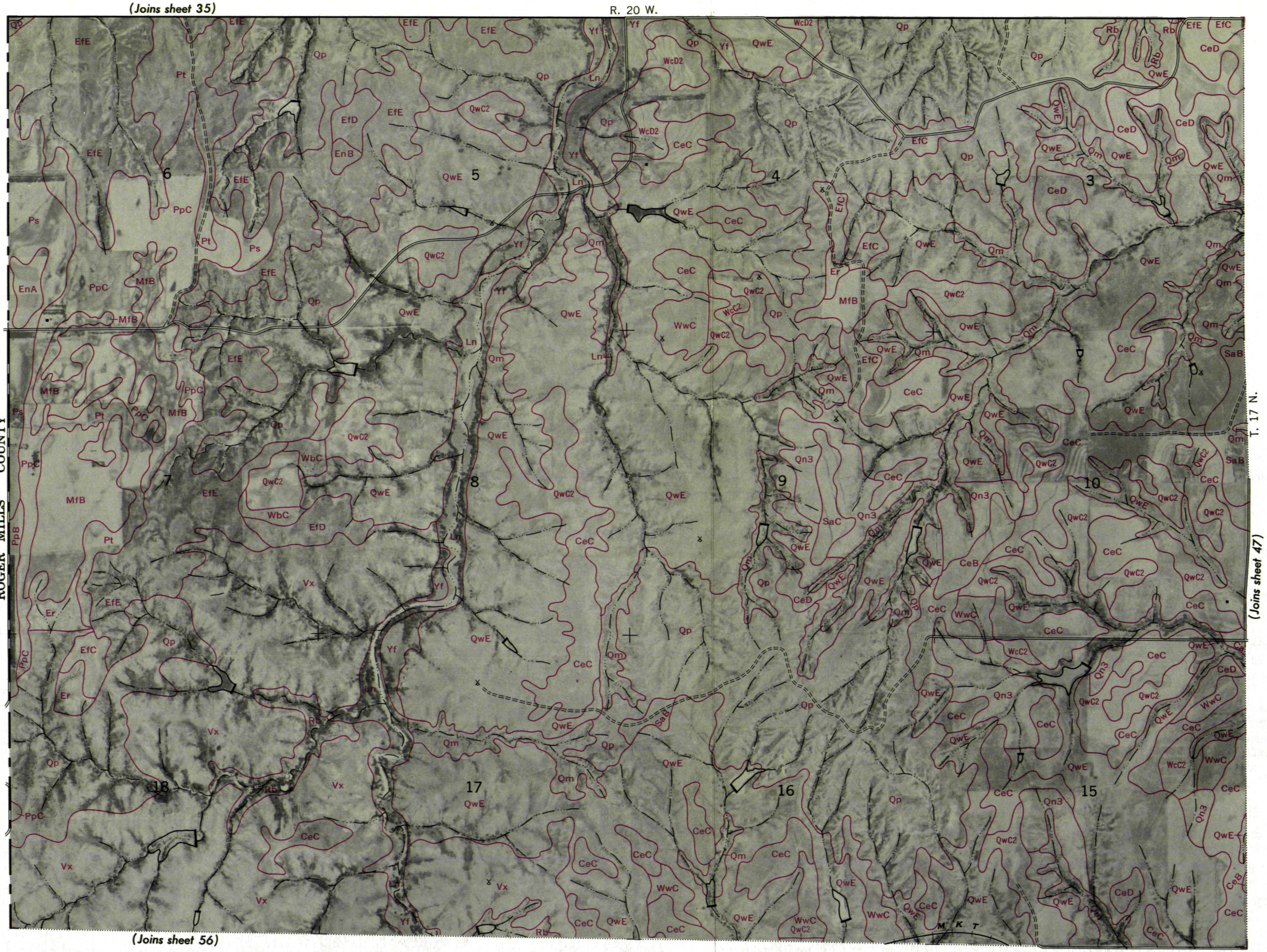




Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

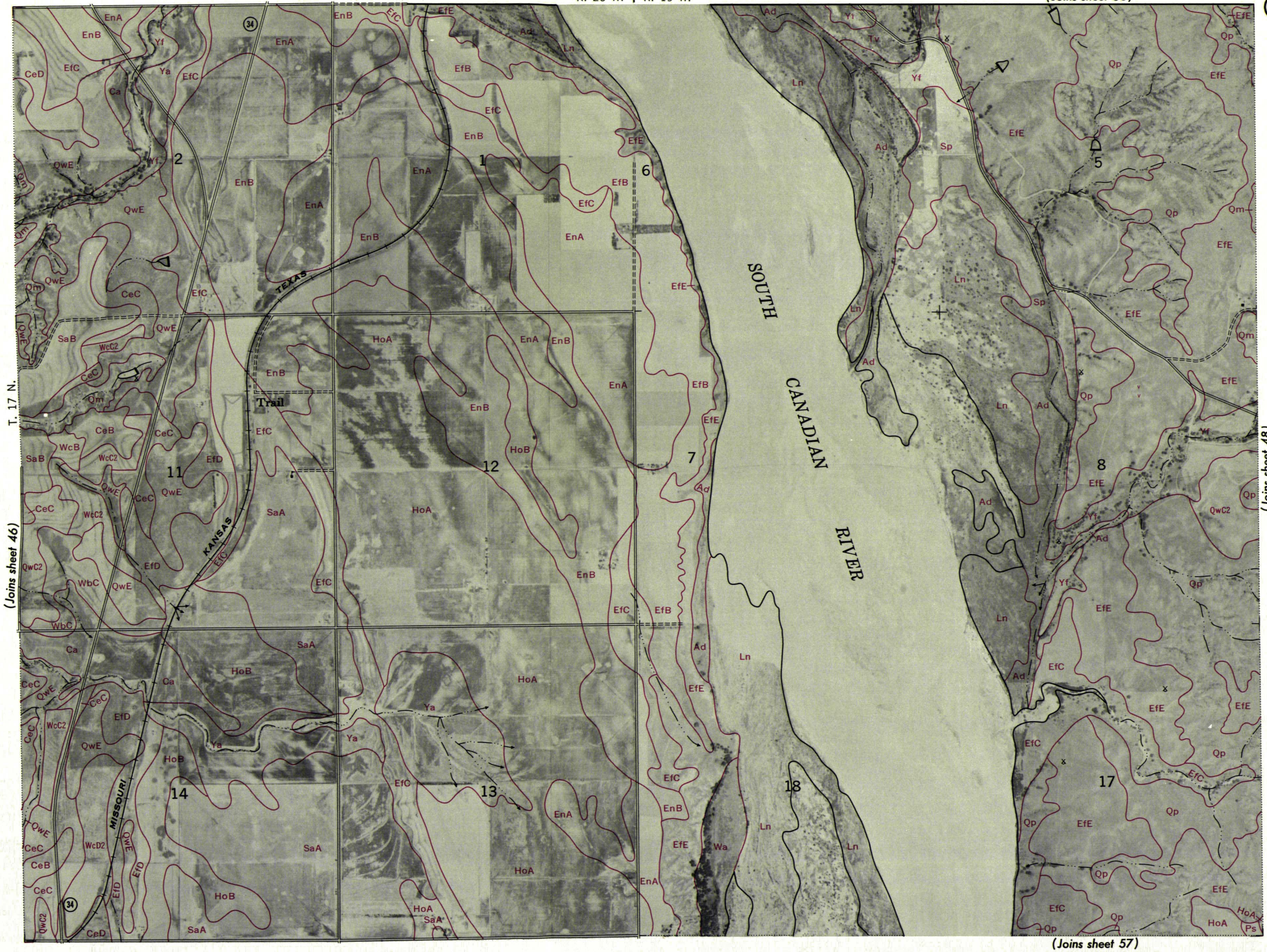


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

R. 20 W. | R. 19 W.

(Joins sheet 36)

47



(Joins sheet 46)

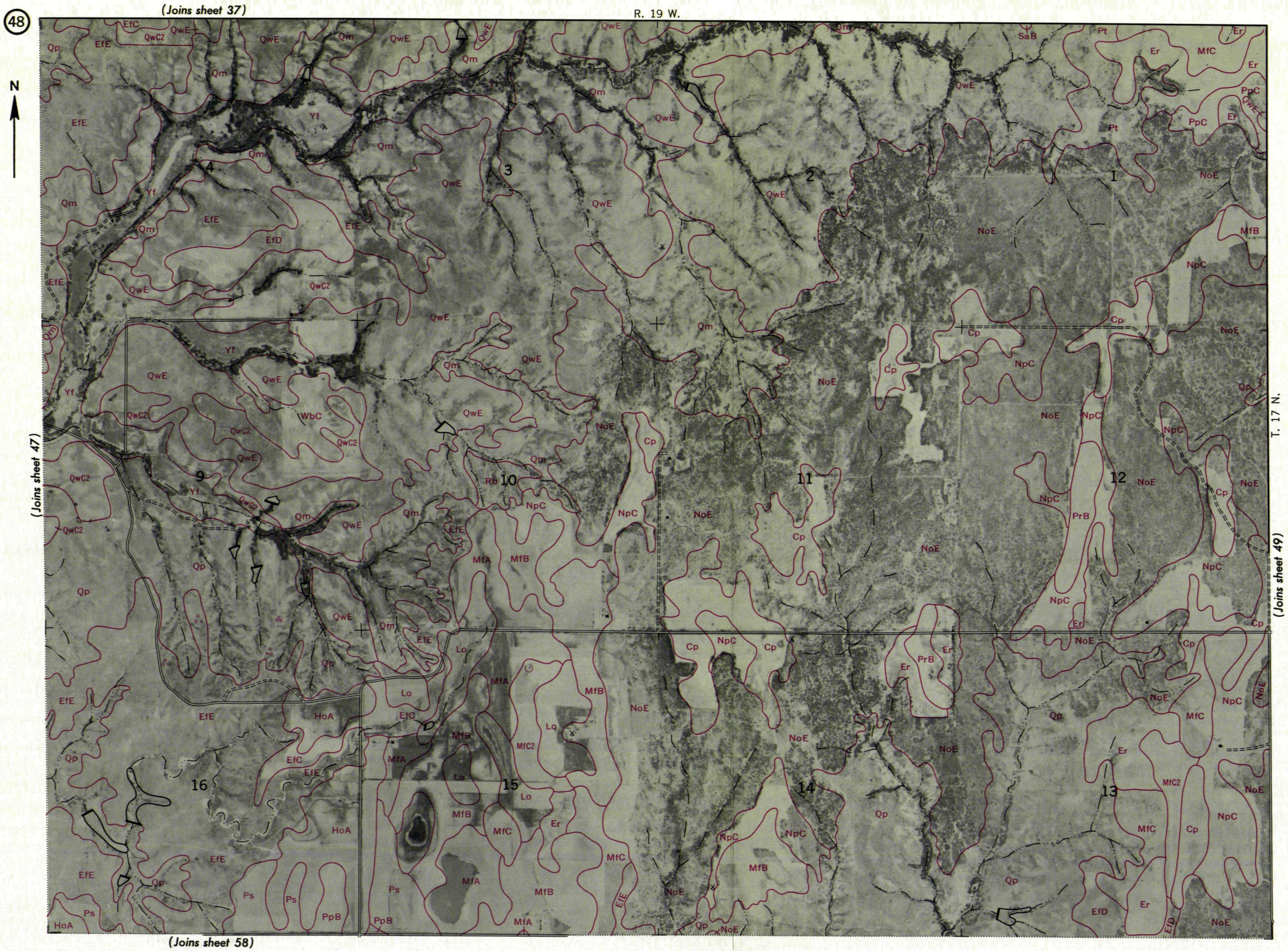
(Joins sheet 48)

(Joins sheet 57)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.



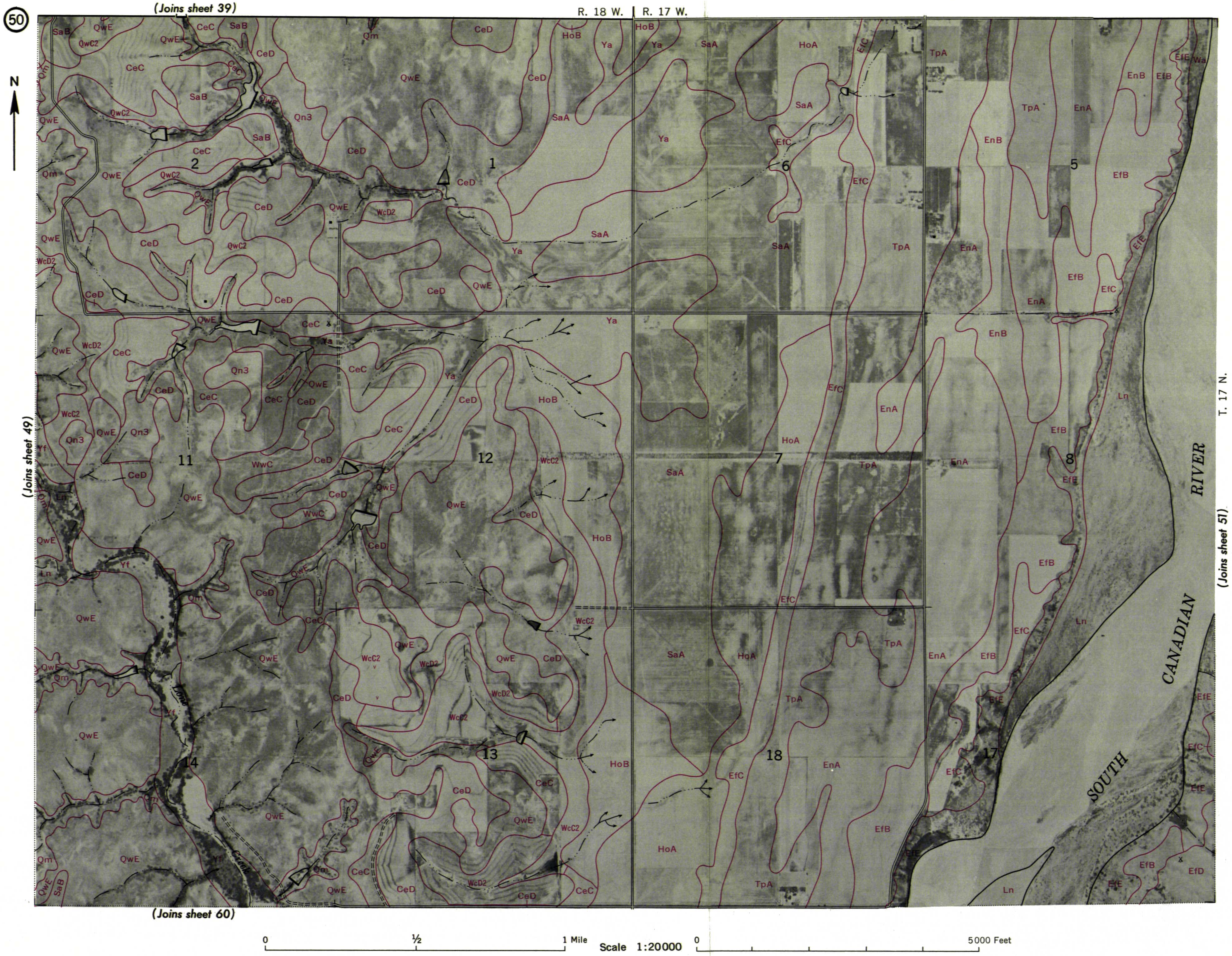
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

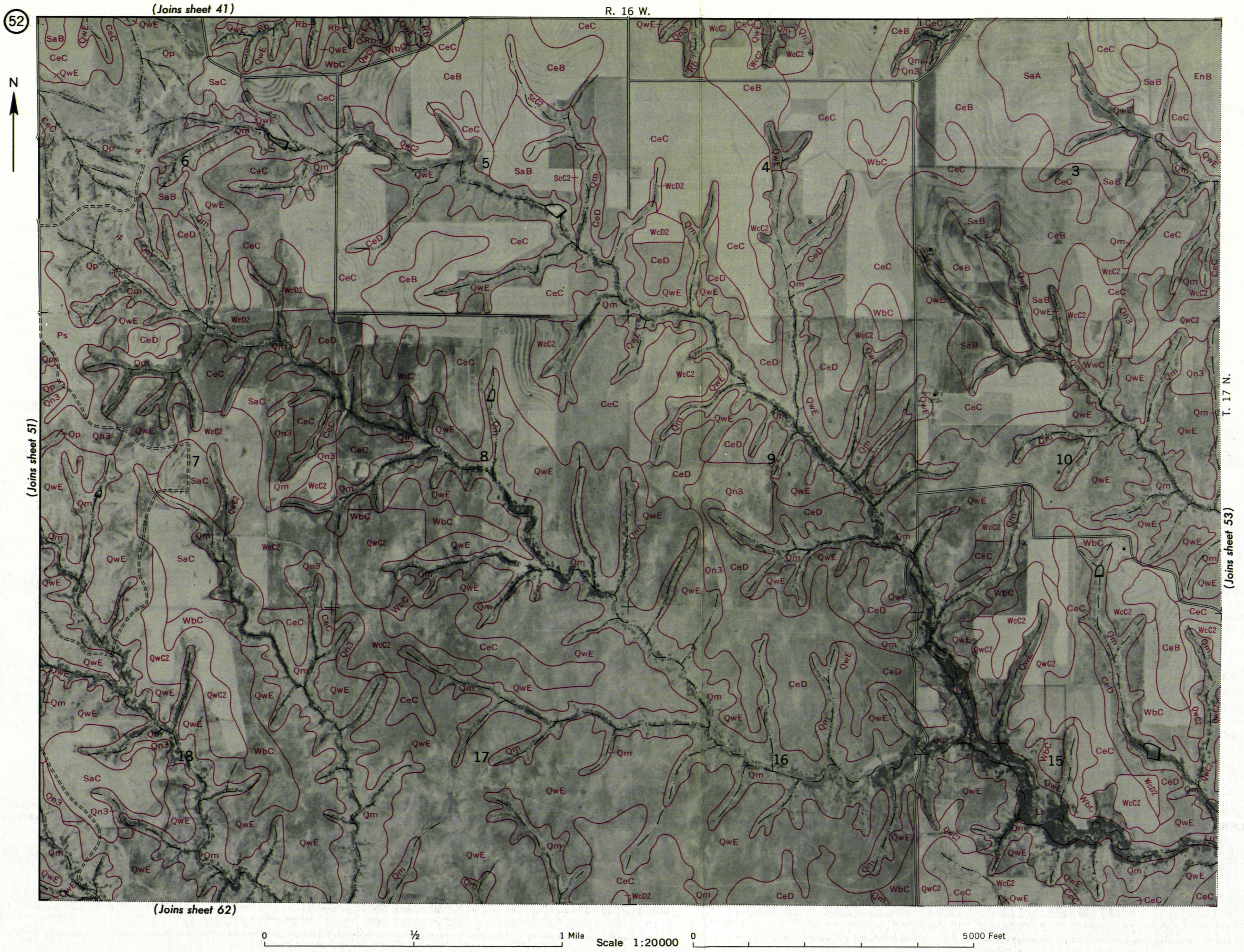
DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 50



This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

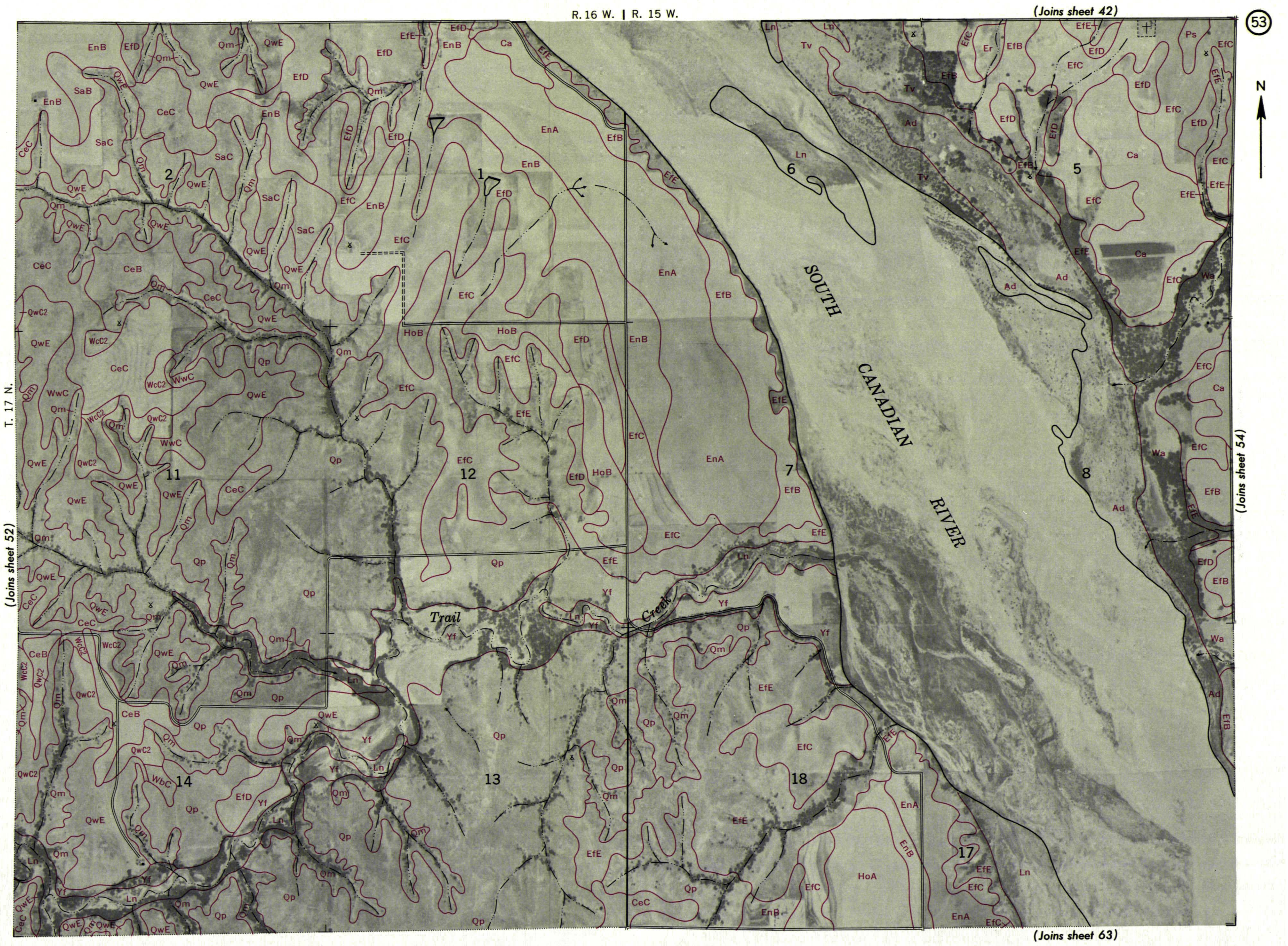
Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

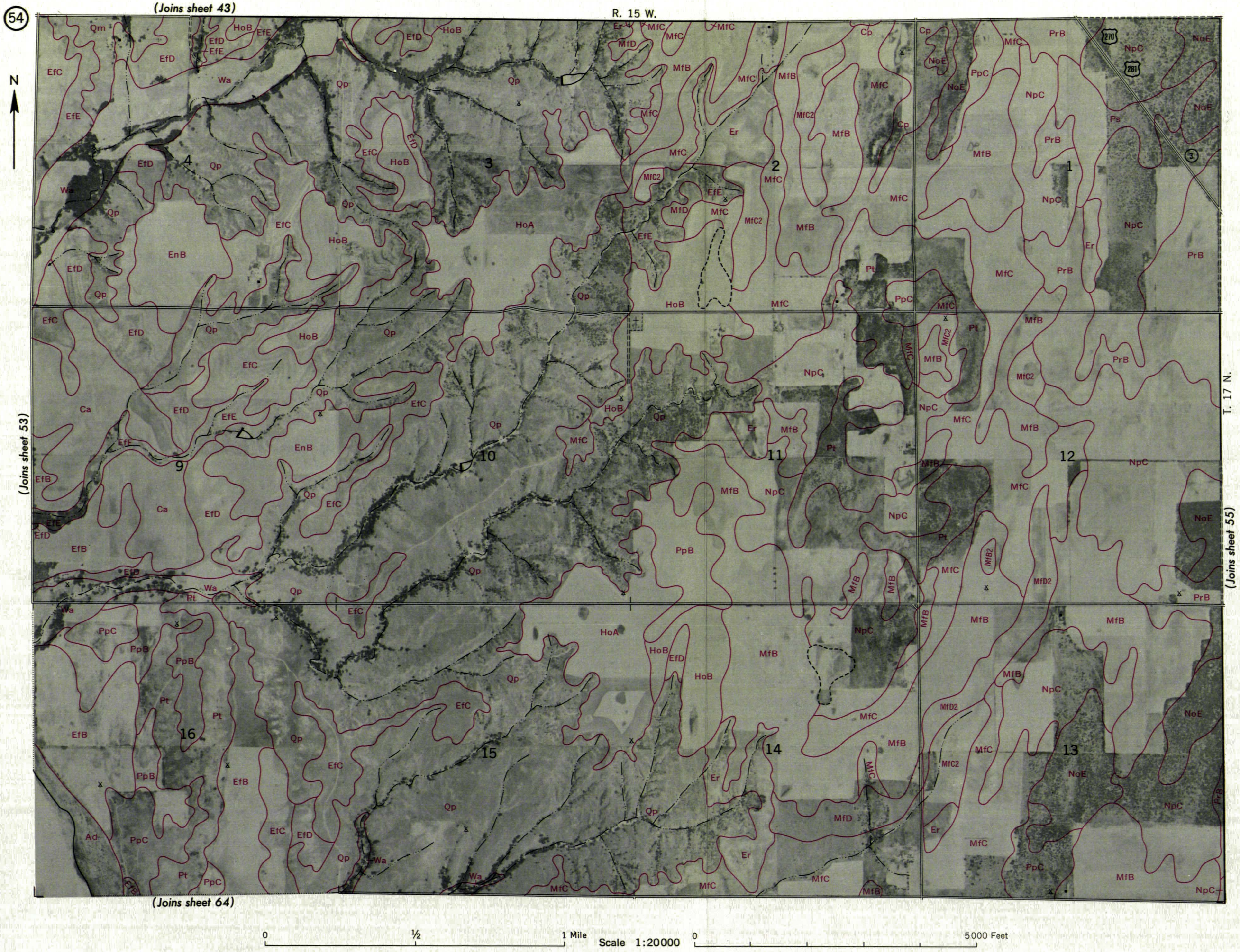

52
(Joins sheet 41)
R. 16 W.
N
(Joins sheet 51)
T. 17 N.
(Joins sheet 53)
(Joins sheet 62)
0
½
1 Mile
Scale 1:20000
0
5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.



0 ½ 1 Mile Scale 1:20000 0 5000 Feet


54
(Joins sheet 43)
R. 15 W.
N
(Joins sheet 53)
(Joins sheet 55)
T. 17 N.
(Joins sheet 64)
1
2
3
4
9
10
11
12
13
14
15
16
270
281
0
½
1 Mile
Scale 1:20000
0
5000 Feet

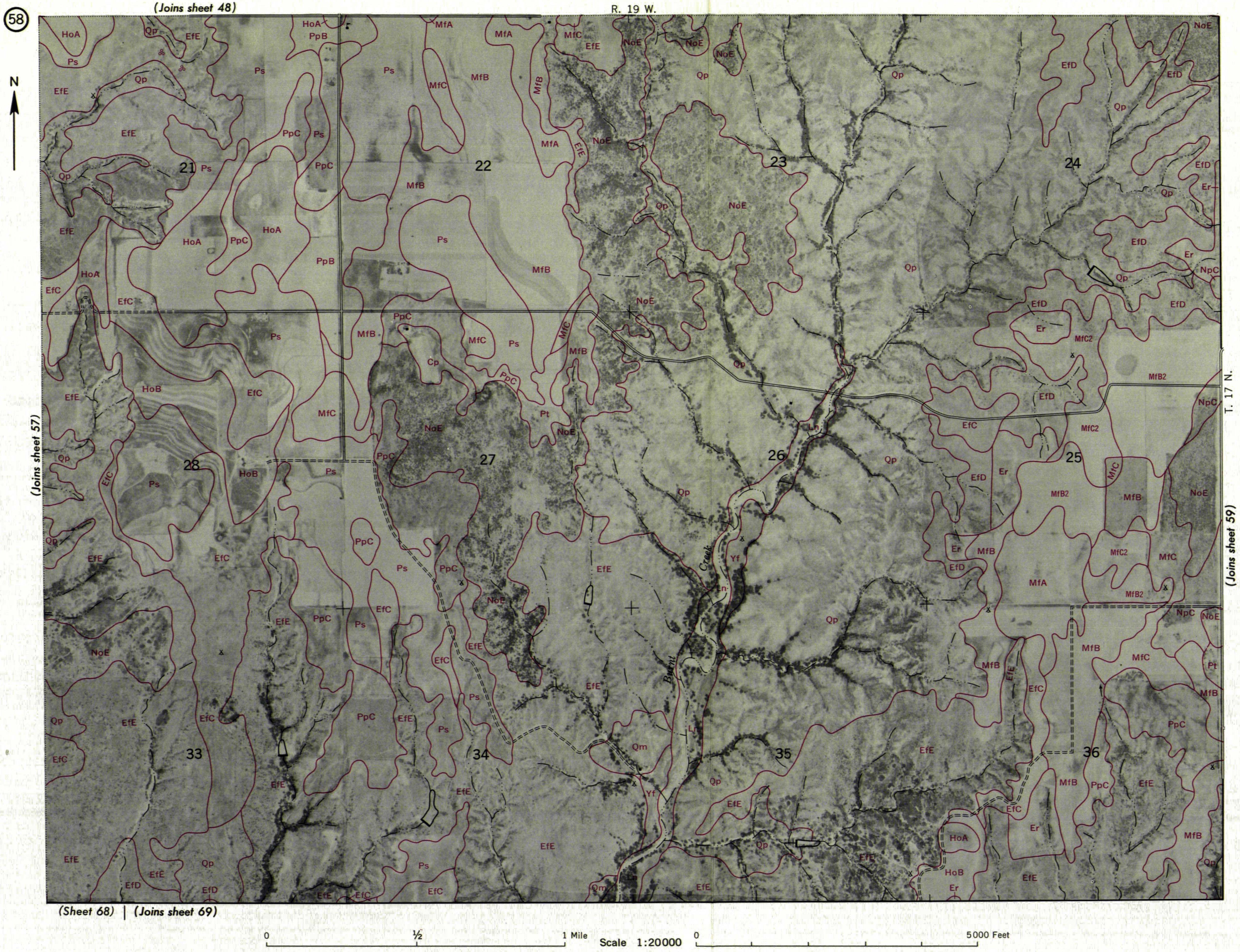
This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.


56
(Joins sheet 46)
R. 20 W.
N
ROGER MILLS COUNTY
T. 17 N.
(Joins sheet 57)
(Joins sheet 67)
M K T
TEXAS
KANSAS
MISSOURI
Red
Creek
34
19
20
21
22
27
28
29
30
31
32
33
34
0
½
1 Mile
Scale 1:20000
0
5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

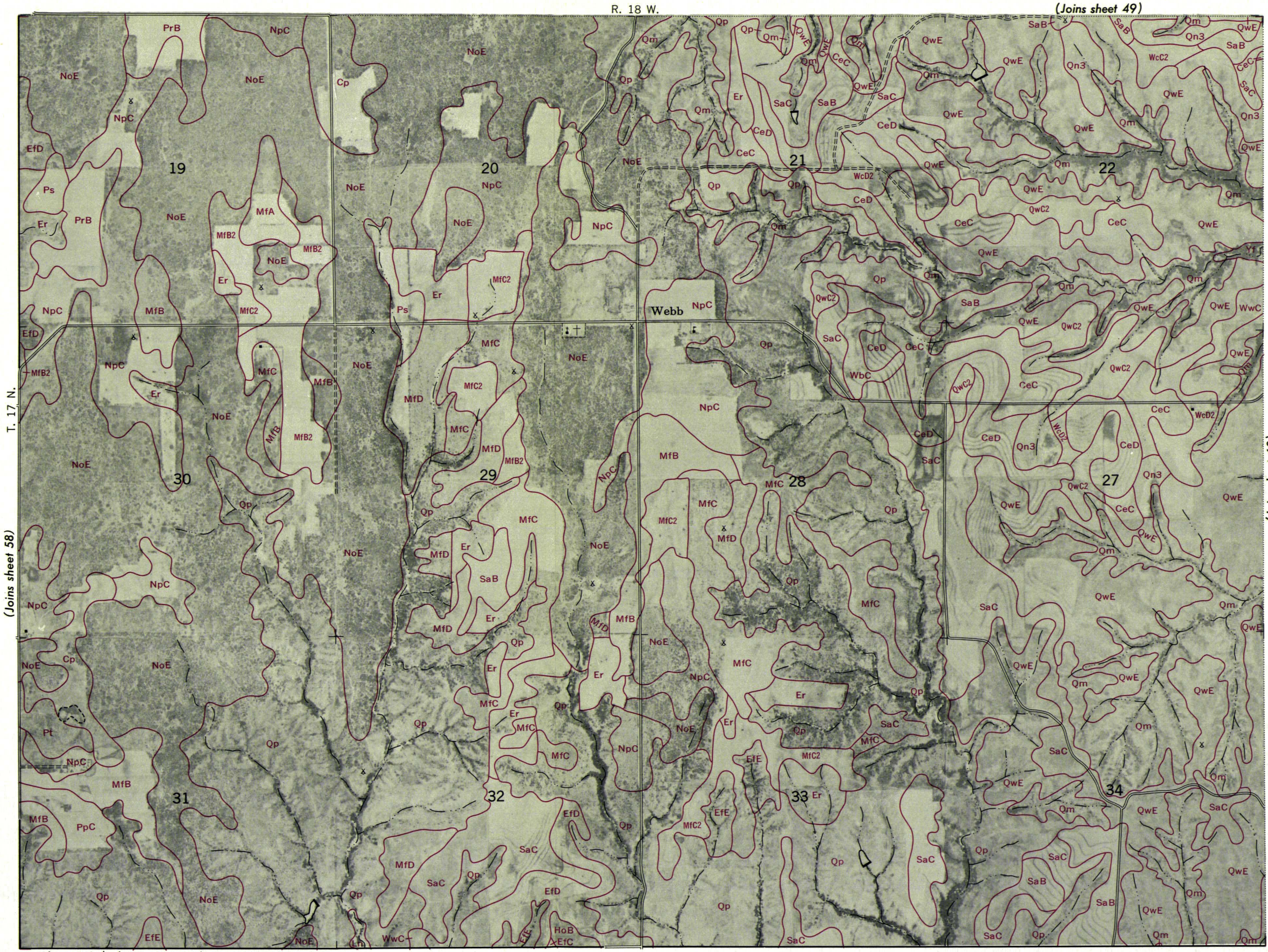
Range, township, and section corners shown on this map are indefinite.


58
(Joins sheet 48)
R. 19 W.
N
(Joins sheet 57)
(Joins sheet 59)
T. 17 N.
21
22
23
24
28
27
26
25
33
34
35
36
Burnt Creek
(Sheet 68) | (Joins sheet 69)
0
½
1 Mile
Scale 1:20000
0
5000 Feet

(59)

R. 18 W.

(Joins sheet 49)



(Joins sheet 58)

(Joins sheet 60)

(Sheet 69) | (Joins sheet 70)

0 ½ 1 Mile

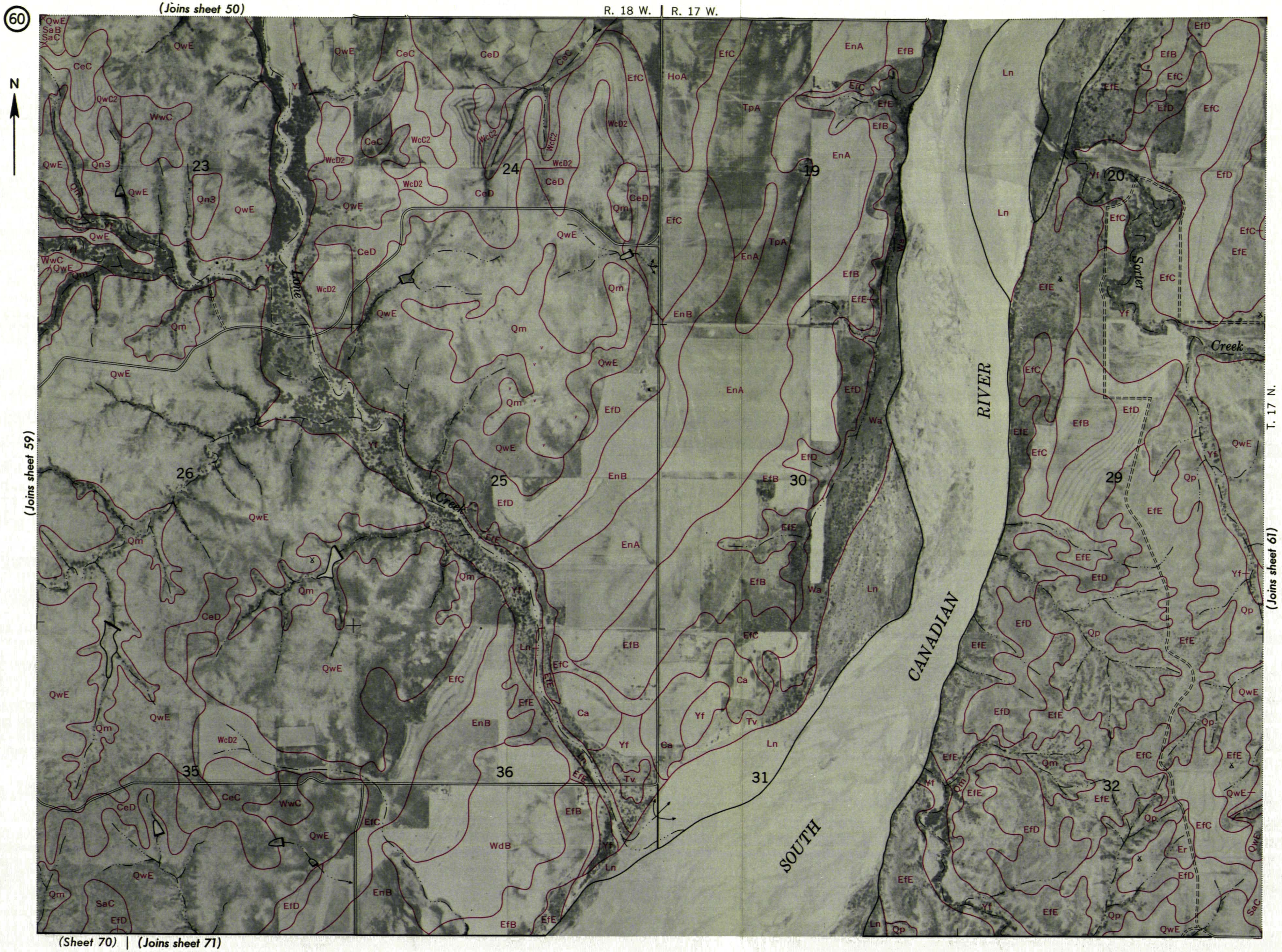
Scale 1:20000

0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 60



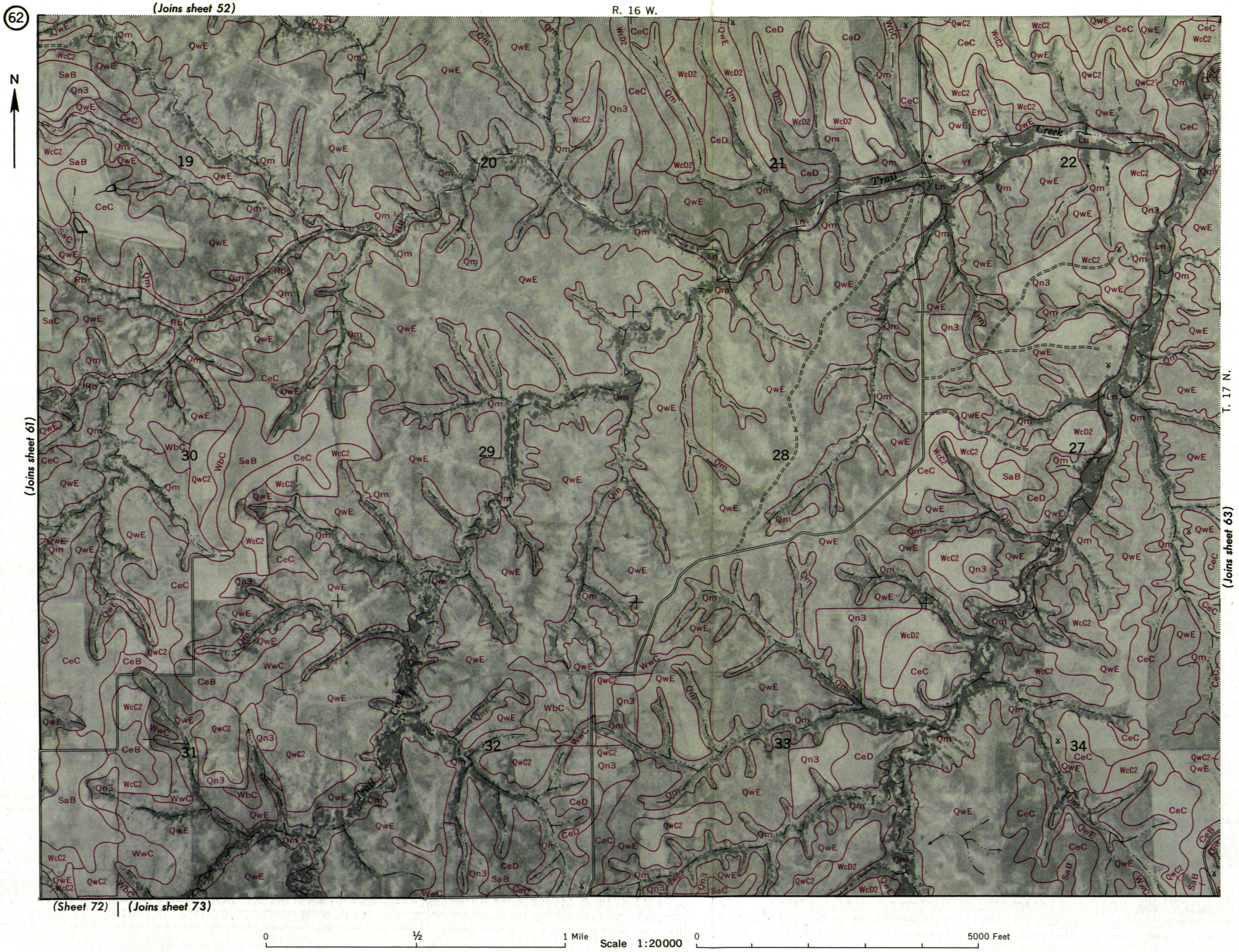
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 61

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.


62
(Joins sheet 52)
R. 16 W.
N
(Joins sheet 61)
(Joins sheet 63)
T. 17 N.
19
20
21
22
30
29
28
27
31
32
33
34
Creek
Trail
(Sheet 72)
(Joins sheet 73)
0
½
1 Mile
Scale 1:20000
0
5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

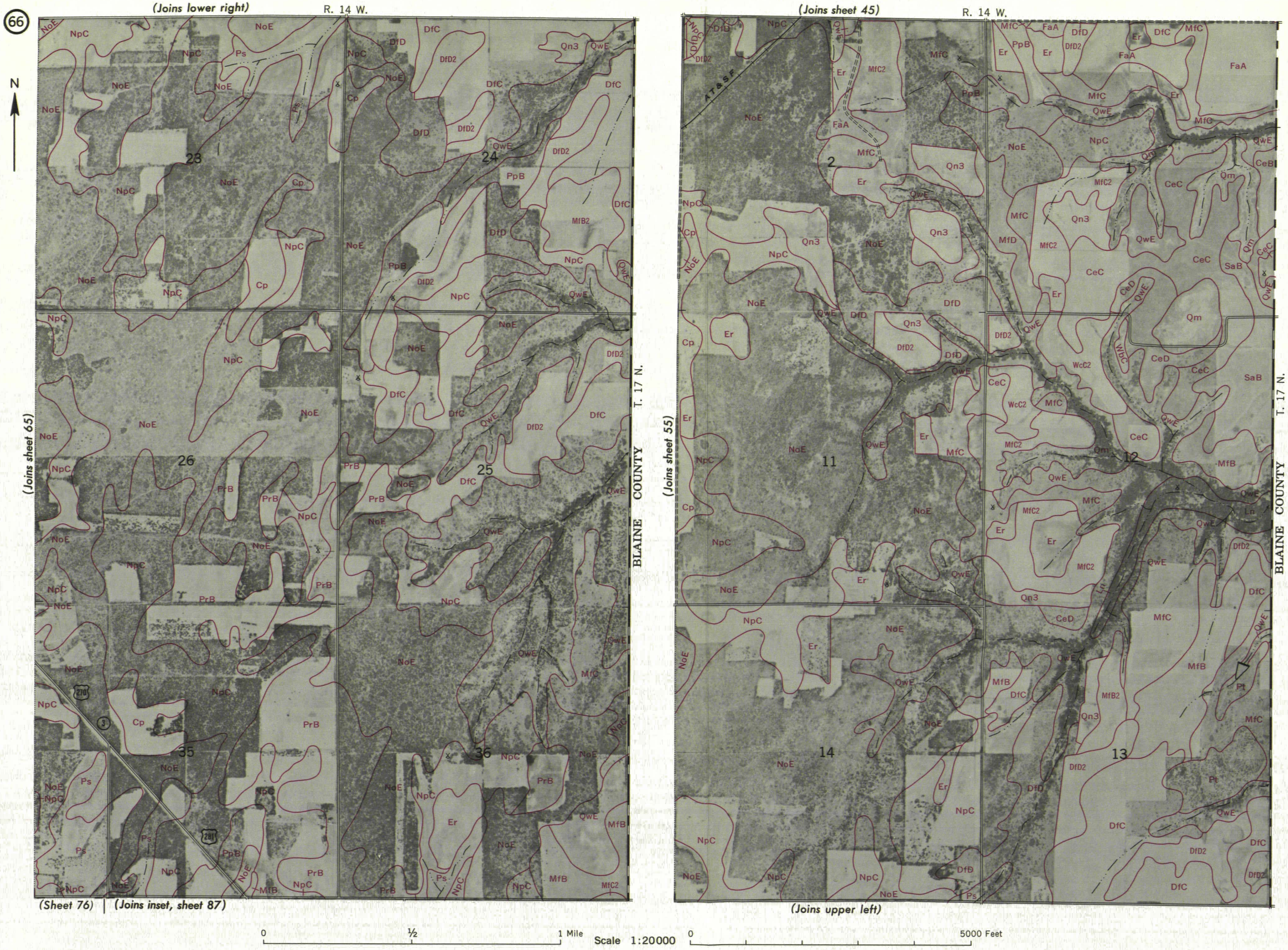
0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

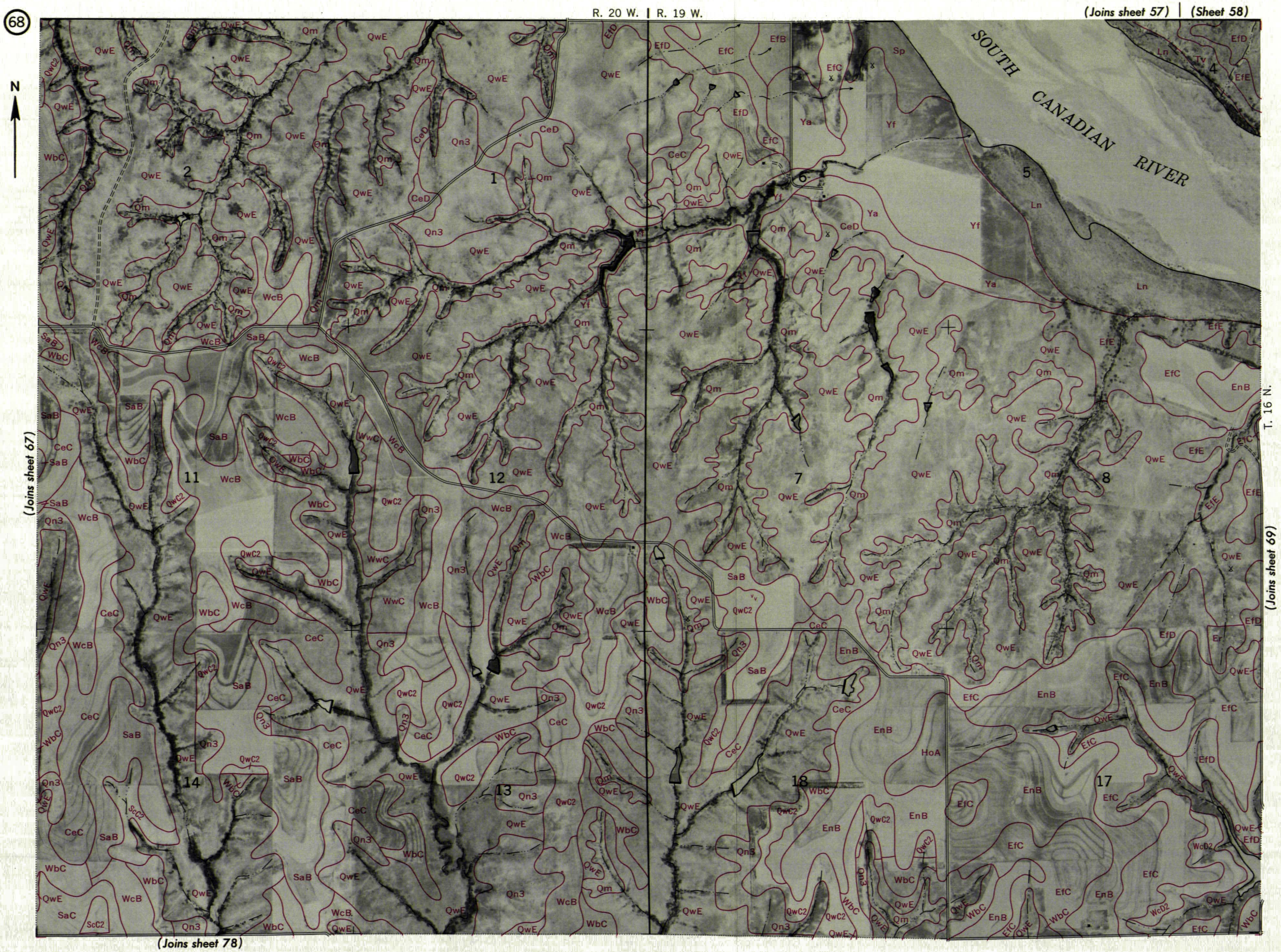

66
(Joins lower right)
R. 14 W.
(Joins sheet 45)
R. 14 W.
N
(Joins sheet 65)
(Joins sheet 55)
T. 17 N.
BLAINE COUNTY
T. 17 N.
BLAINE COUNTY
AT&SF
23
24
26
25
35
36
2
1
11
12
14
13
(Sheet 76)
(Joins inset, sheet 87)
(Joins upper left)
0
½
1 Mile
Scale 1:20000
0
5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 68



0 ½ 1 Mile Scale 1:20000 0 5000 Feet

Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

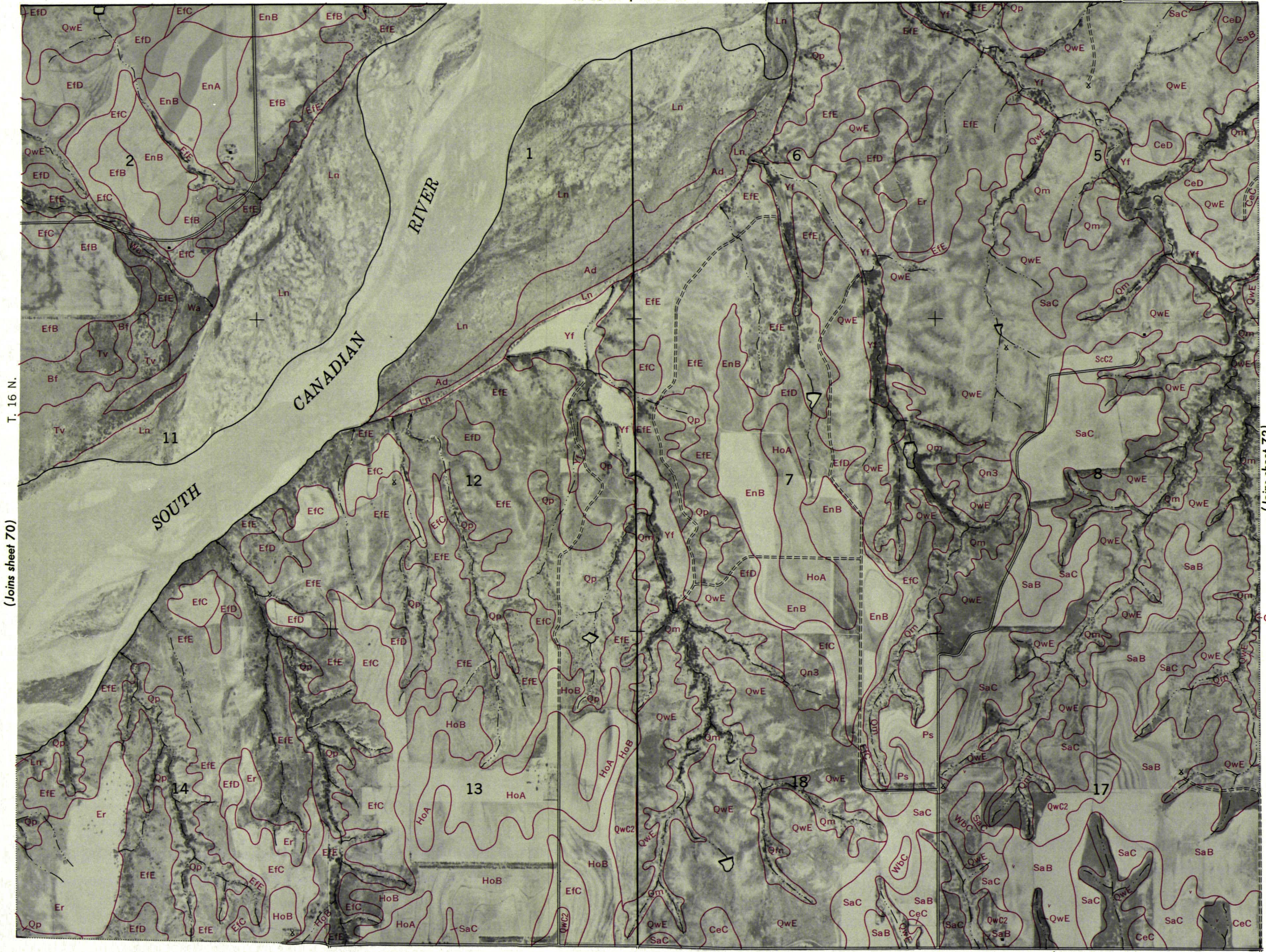
DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 70

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

R. 18 W. | R. 17 W.

(Joins sheet 60) | (Sheet 61)

71



T. 16 N.

(Joins sheet 70)

(Joins sheet 72)

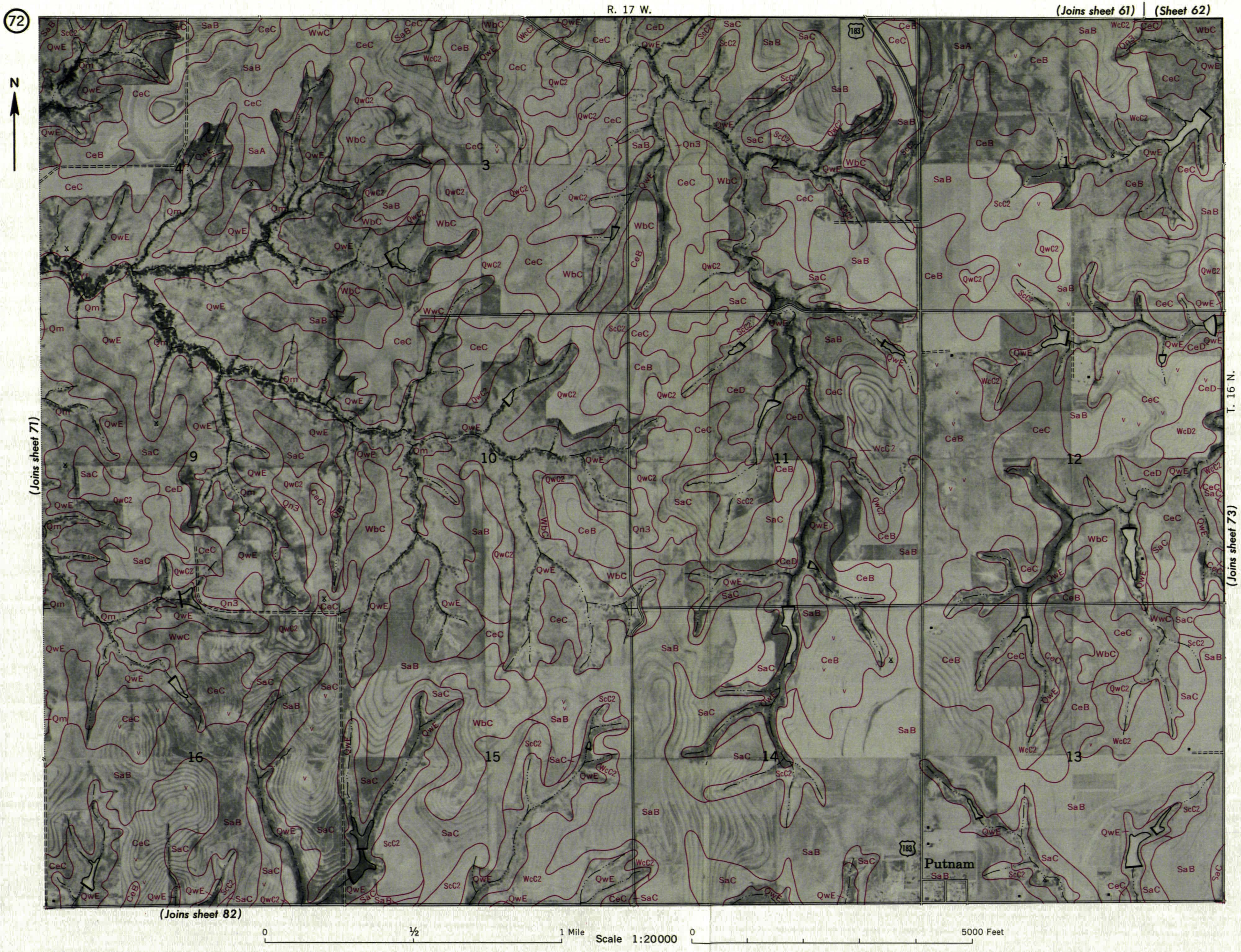
(Joins sheet 81)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

N

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.


72
R. 17 W.
(Joins sheet 61)
(Sheet 62)
N
T. 16 N.
(Joins sheet 71)
(Joins sheet 73)
(Joins sheet 82)
Putnam
183
0
½
1 Mile
Scale 1:20000
0
5000 Feet

R. 16 W.

(Joins sheet 62) | (Sheet 63)

73

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

T. 16 N.

(Joins sheet 72)

(Joins sheet 74)

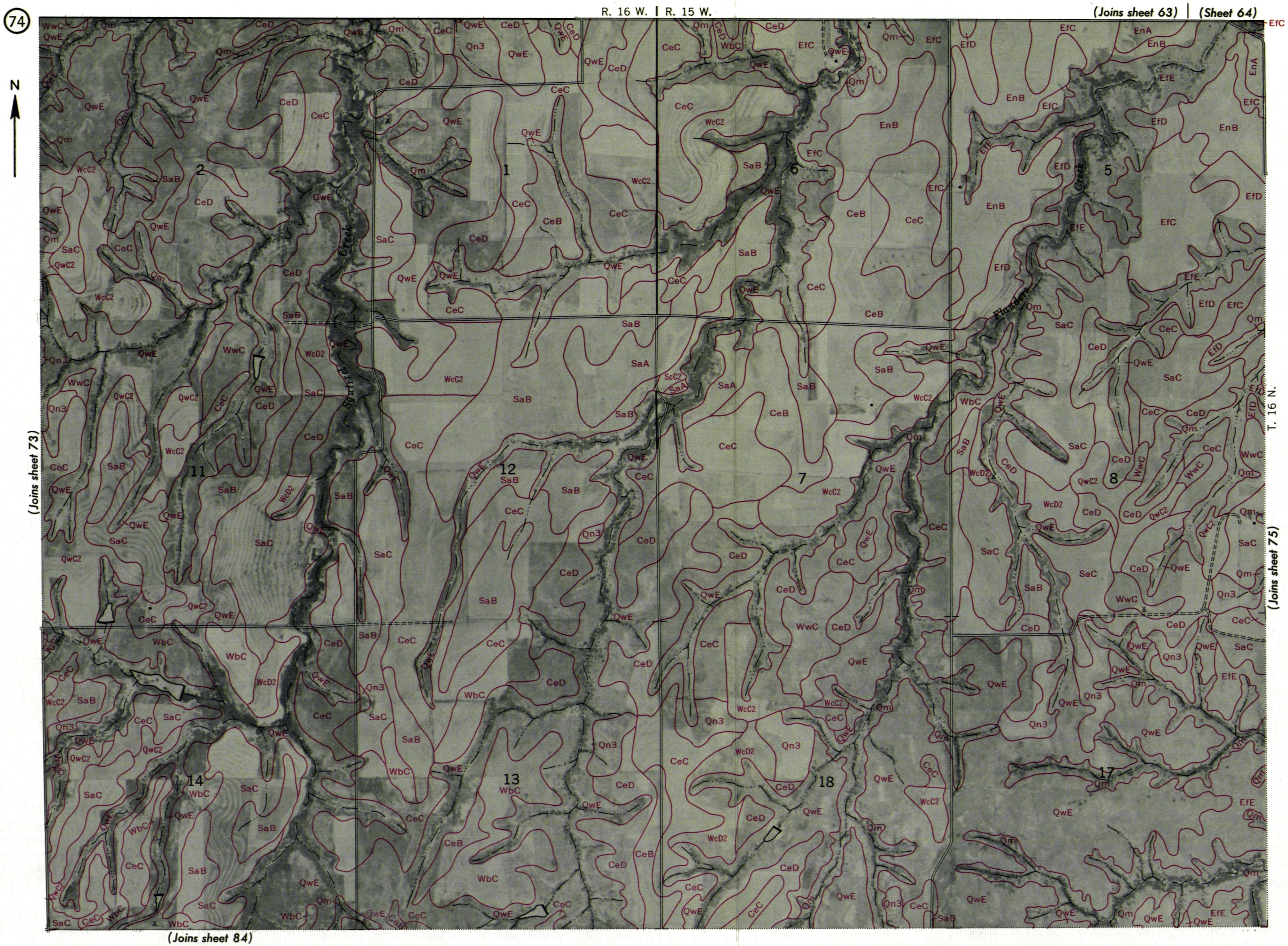
(Joins sheet 83)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 74



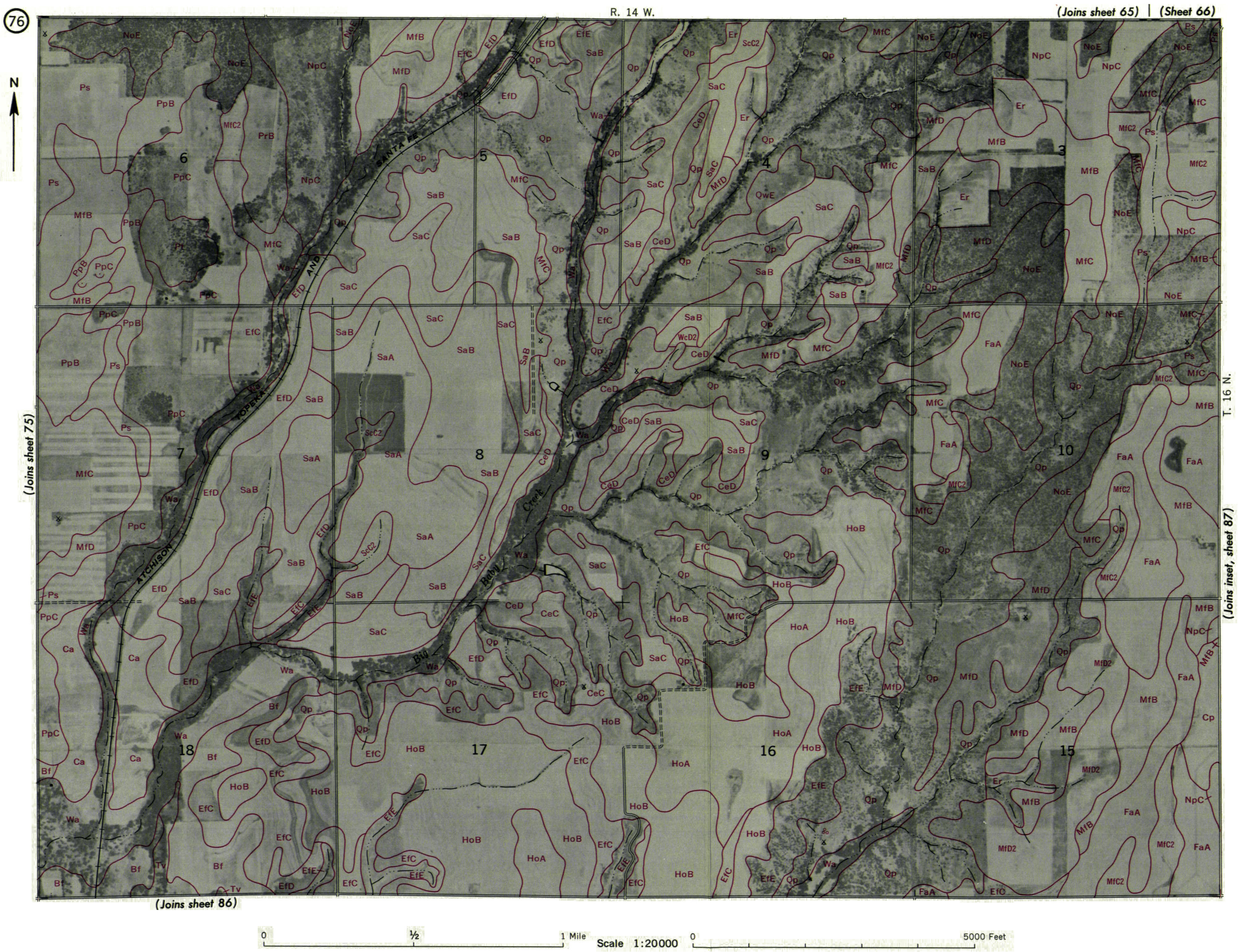
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 76



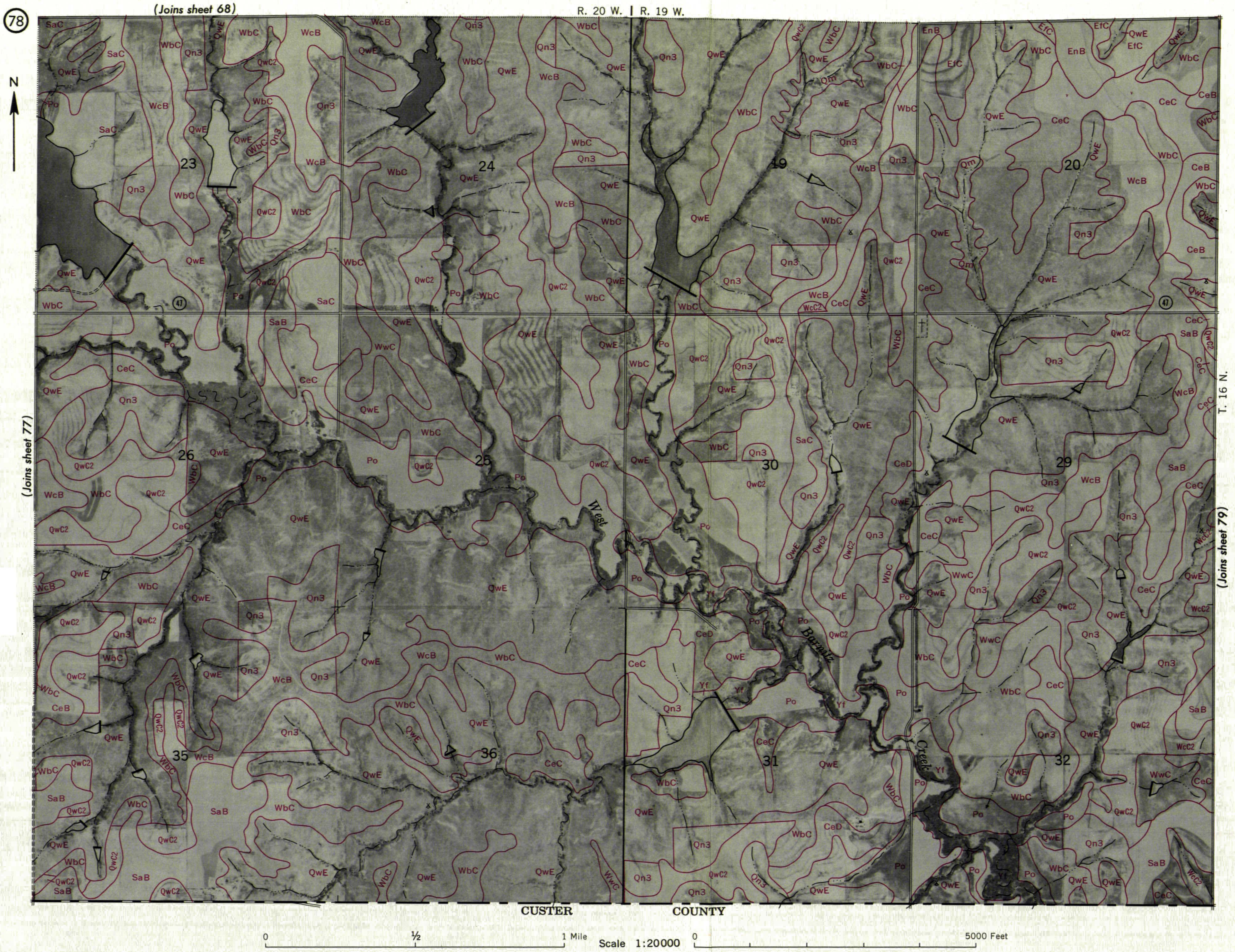
DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 77

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 78



This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

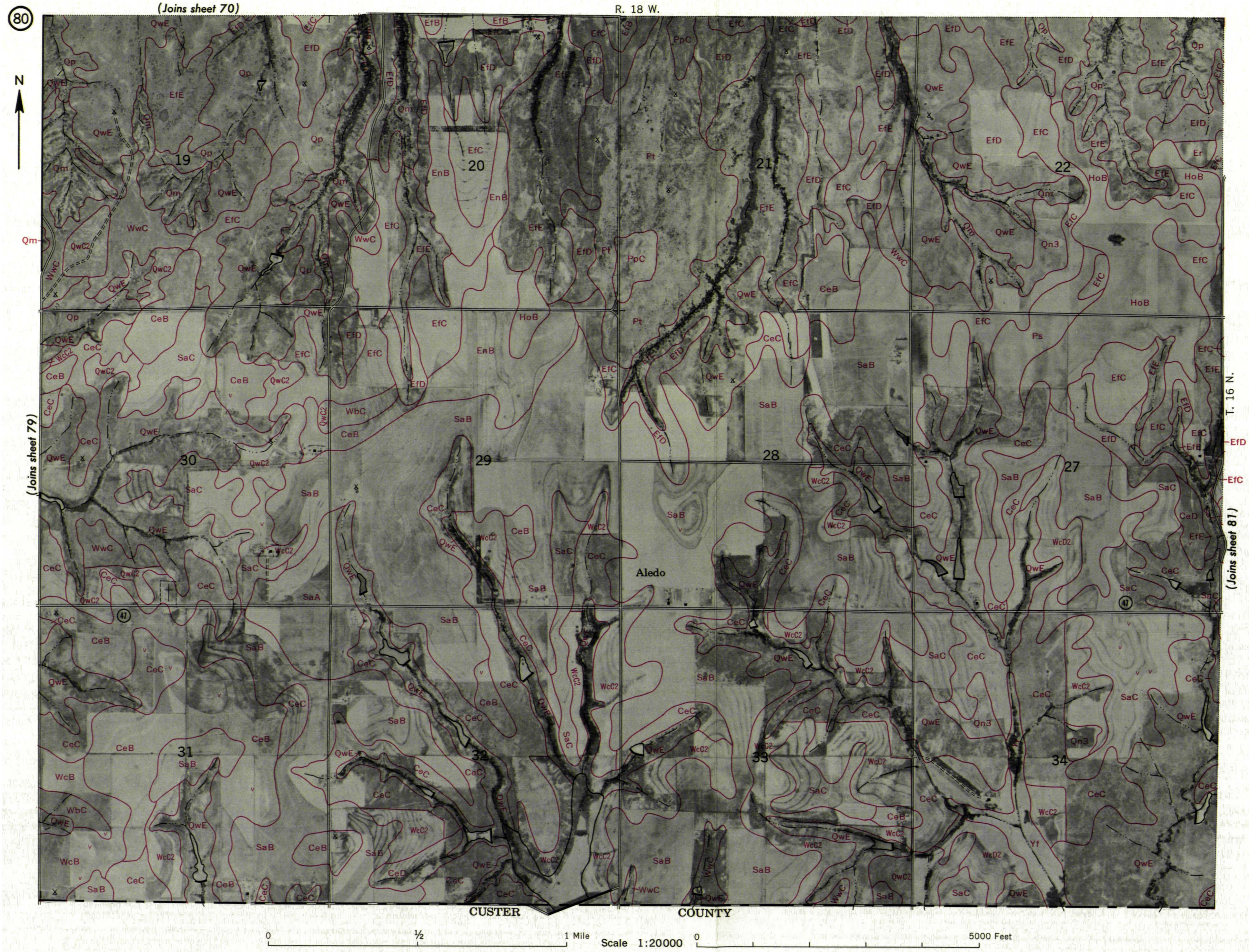
Range, township, and section corners shown on this map are indefinite.

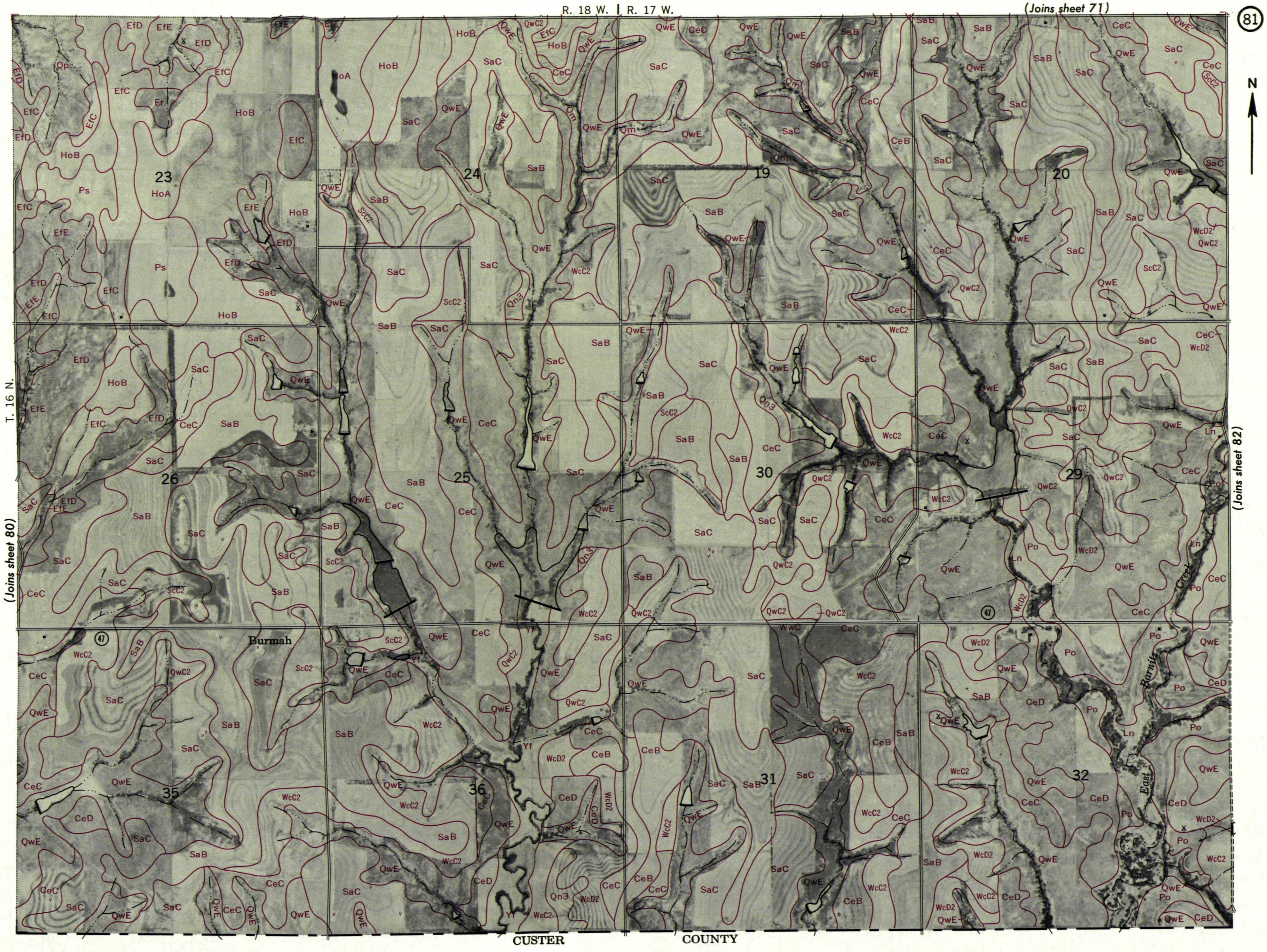
Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 80





0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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Range, township, and section corners shown on this map are indefinite.

82

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 84

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.


86
(Joins sheet 76)
R. 14 W.
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Nobscot
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SOUTH
CANADIAN
RIVER
(Joins sheet 85)
(Joins sheet 87)
T. 16 N.
CUSTER
COUNTY
0
½
1 Mile
Scale 1:20 000
0
5000 Feet

DEWEY COUNTY, OKLAHOMA — SHEET NUMBER 87

This map is one of a set compiled in 1962, as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1:20000 0 5000 Feet